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## The medical school curriculum is not designed for long-term retention: we should stop being alarmed when our learners forget

## Le programme des études de médecine n'est pas conçu pour une rétention à long terme : nous devrions cesser de nous alarmer lorsque nos apprenants oublient

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For years we have known about the overcrowded curriculum and suspected its deleterious effects on both student wellbeing and their learning.<sup>1,2</sup> Multiple calls to address this situation have produced little or no lasting change. Slavin and I have argued in this journal before that the medical school curriculum, likened to drinking from a water cannon, is an impediment to change.<sup>1</sup> In one important way, it is also an impediment to learning, which is the change we hope to see in medical students. I believe that medical schools are not designed for retention for holding the material in long term memory so we should stop being alarmed or discouraged when they forget.

This claim may seem like an absurd and fatalistic response. Is long-term learning not an axiom of professional education? Are there not national examinations in most countries and are not students, when they arrive on clinical rotations, grilled on information we expect them to know? Do we not *want*, *expect*, and even *demand* that students retain information? Of course we do, but intentions and designs are different. While medical educators may claim that the curricula are designed for long-term retention, the empirical reality is far different, as the evidence shows. Numerous studies attest to the lack of long-term retention among medical students.<sup>3-5</sup> This endemic forgetting is not getting any better and can be conveniently confirmed by

the testimony of most (if not all) medical students past and present.

Strategies that support long term retention must first focus on a reasonable number of objectives and the related attitudes, skills, and knowledge that are most important, that active professionals will use in the discharge of their responsibilities. Inert and esoteric material must not be included. Unfortunately, all the material found in medical school curricula does not have a clear and compelling rationale for inclusion.<sup>6</sup> However, the main reason I want to explain and the firm basis for my claim is that the design and sequencing (and yes, the volume) of the learning activities do not support long term retention.

Briefly, long term retention is built on evidence-based strategies to ensure strong initial learning followed by frequent testing which can be formal or informal usually grounded in continuing use and application to common and important problems or cases. First, most curricula do not lean on the science of learning. Even the vaunted Problem-based learning has a shallow pool of evidence. Spaced learning and practice, retrieval practice, and to a lesser extent, elaboration all have strong evidence for deep learning.<sup>7-9</sup> These are not systematically designed into medical school curricula. More importantly, learners do not have the time or energy to generate the effort for some valuable independent learning that helps to establish and

sustain long term memory. With a constant barrage of new information, likened to drinking from a water cannon,<sup>1</sup> much of it of questionable utility or value, medical students have little time to devote to reviewing, connecting, and practicing. When they do, they may be too tired.

Some years ago, I encountered two first year medical students who were having, between classes, a serious conversation. As I passed by and greeted them, they told me they had a dilemma and wanted to know my take on it. They told me they wanted to thoroughly understand and learn the material they were being taught but that they did not have the time to devote to such a goal. (They did not say it but I'm sure the water cannon metaphor is appropriate here.) They had narrowed their choices down to either skipping lectures to gain extra time to study or cramming for the tests just to pass them. This is the devil's dilemma our students face on a regular basis. Many faculty have told students to learn the stuff that will make them better doctors. With mixed feelings I have told students they needed to pass the tests, or they wouldn't get a chance to be doctors. That often means abandoning the deep understanding and long-term learning that I know is vitally important and leaning into some cramming.

While a constant stream of quizzes and assignments may keep students focused on some of the more knowledge-based material, little attention is paid to practicing clinical and communications skills outside of class. I imagine that residency program directors would be ecstatic if medical students practiced and became proficient in the basic clinical skills. Boot camps, now more common, are residency program attempts to make up for this lack of preparation.

The medical school curriculum is not well designed for deep learning and long-term retention. What can be done? First, let's not be shocked or worse, blame the students, when our evaluation data show poor long-term retention; we've done it to ourselves which means we can also undo it. Medical schools can be intentional about retention by 1) designing in-learning activities for which there is good evidence for long-term remembering; 2) allowing more time for learners to engage in independent study and practice; and 3) monitoring the short-, mid-, and long-term outcomes and adjust as needed. We can and should create curricula that support long-term retention.

In this issue of the CMEJ you will find articles that also challenge the status quo and help us see common experiences in new light.

## Original Research

Ahmed and team's article, [Exploring the experiences of Canadian medical students with a background in the arts and humanities](#)<sup>10</sup> looked at the advantages and disadvantages for medical students with backgrounds in Arts and Humanities. They found that the students perceived their Arts and Humanities identity as intertwined with their medical trainee identity but faced difficulties relating to peers from science backgrounds.

[The hidden curriculum across medical disciplines: an examination of scope, impact, and context](#) by Schultz et al.<sup>11</sup> comprehensively studied aspects of the hidden curriculum (HC) –the inferred messages about values and norms that both medical learners and physicians surmise from their interactions, group dynamics, policies, etc. –at their medical institutions.

[The CanMEDS Competency Framework in laboratory medicine: a phenomenographic study exploring how professional roles are applied outside the clinical environment](#) by Bogaty and Frambach<sup>12</sup> studied how the CanMEDS Competency Framework is used in non-clinical laboratory medicine specialties that do not take part in direct patient contact. They found that the current framework needs better alignment with the unique needs and aspects of laboratory medicine specialties.

## Brief Reports

[Medical students' perceptions on preparedness and care delivery for patients with autism or intellectual disability](#) by Bitektine, Hintermayer, and team<sup>13</sup> highlighted the low perceived preparedness of medical students to accommodate for patients with autism spectrum disorder (ASD) or intellectual developmental disorder (IDD). However, their results showed medical trainees desired more instruction to improve their preparedness to work with these patients.

Erika Maxwell and co-authors' article, [A survey of undergraduate medical students' gender awareness and bias: the Newfoundland and Labrador perspective](#),<sup>14</sup> explored medical students' gender bias toward physicians and patients. Their results indicated that the students had non-biased ideologies concerning gender in medicine.

Wiper-Bergeron and team's article, [Extending social accountability mandates to biomedical research in Canadian faculties of medicine](#),<sup>15</sup> considered first-year graduate students' perceptions of the importance of social accountability. While over 80% of respondents were committed to integrating it into their future research, only

a few students felt confident in their abilities to integrate it. The authors, therefore, proposed that future research should be directed toward educational initiatives for both biomedical faculty and students.

Bondok et al.'s report, [Trends in ophthalmology applicants going unmatched in the Canadian Resident Matching Service](#),<sup>16</sup> investigated the match rates of ophthalmology applicants in the CaRMS (Canadian Resident Matching Service) process compared to other competitive specialties. The results showed that ophthalmology applicants are more likely to go unmatched and often do not participate in the second iteration of the match process. The authors highlighted the need for further research to improve the match process for ophthalmology applicants.

### Reviews, Theoretical Papers, and Meta-Analyses

[The impact of the medical school admissions interview: a systematic review](#) by Lin and team<sup>17</sup> examined characteristics and outcomes of medical students admitted with and without interviews to determine the impact of the interview as part of the medical school admissions process. Overall, they found little difference between students admitted to medical school with and without interviews concerning academic scores and clinical performance.

### Black Ice

Dhara and Fraser's article, [Five ways to get a grip on teaching advocacy in medical education: the health humanities as a novel approach](#),<sup>18</sup> advocated for the advocate role in medical curricula. They presented five ways – including engaging learners in curricular decisions – to incorporate humanities-based education to teach the advocate role in medical curricula.

### You Should Try This!

Pauline Larouche and team wrote, [Jeu d'évasion médical : expérimentation d'une nouvelle méthode pédagogique](#).<sup>19</sup> They used the concept of popular escape games by creating puzzles in clinical situations with medical content. Their innovation was a fun way to develop many CanMEDS roles. This is a French article

Moon and D'Eon wrote, [A practical model of faculty development in medical education: make it accessible, versatile, and easy to use](#).<sup>20</sup> They designed a flexible faculty development program model that offers a wide range of medical education topics for educators, enabling personalized professional growth and easy integration into existing programs.

[A multilingual sexual and reproductive health animation: a novel educational tool for newcomer patients](#) by Sivakumar and team<sup>21</sup> described an educational tool on sexual and reproductive health designed for newcomer populations. They hope this animation tool helps improve inclusion and trust for newcomer patients.

[Perspectives on a virtual student-led research conference in ophthalmology](#) by Pur et al.<sup>22</sup> described an online ophthalmology conference. After the event, students reported a better understanding of the specialty. They highlighted the conference's effectiveness in supporting students interested in exploring careers in ophthalmology.

### Commentary and Opinions

In [Apple Vision Pro and the advancement of medical education with extended reality](#),<sup>23</sup> Waisberg et al. presented a spatial computing device, the Apple Vision Pro, and future developments in virtual, augmented, and extended reality as extremely promising advancements for medical education. The authors recognized these developments as potentially advancing medical education through increased simulated clinical scenarios, anatomy teaching, and more.

[The utility of the MD extension program in Canadian medical education](#) by Sunil Ruparelia and team<sup>24</sup> highlighted the benefits and implications of the medical doctorate extension program for unmatched Canadian medical students before reapplication in the CaRMS process.

Mahayosnand et al. wrote [COVID-19 lessons learned: public health research should be integrated into medical school curricula](#).<sup>25</sup> In this commentary, the authors underscored the need to strengthen public health alongside clinical care to prepare future physicians and improve patient care.

Moustafa's commentary, [Dismantling discrimination through education](#),<sup>26</sup> discussed some issues of racism and argued that racism is an indefensible behaviour.

### Letters to the Editor

Prazeres' letter, [Responses to "On the advantages and disadvantages of virtual continuing medical education: a scoping review"](#),<sup>27</sup> commented on a [review](#) by Cheng and team.<sup>28</sup> Prazeres contended that the review lacked two important advantages of Virtual Continuing Medical Education – including protecting doctors with underlying health conditions.

Neufeld's letter, [A few comments on "Let food be thy knowledge gap: the lack of nutrition education in medical curricula,"](#)<sup>29</sup> responded to Esmonde-White's [commentary](#)<sup>30</sup> on the critical need for increased dietary and nutrition education for medical trainees. Neufeld concurred with Esmonde-White and gave some practical tips – such how to apply concepts in real time – that ought to be applied to nutrition education.

## Image

Yaghy created a digital image, [From curiosity to cure](#),<sup>31</sup> to portray how children's admiration for medical professionals can motivate children to pursue medicine. This is the cover image for this issue.

## Enjoy!



**Marcel D'Eon**  
CMEJ Editor-in-Chief

## References

- Slavin S, D'Eon M. Overcrowded curriculum is an impediment to change (Part A). *Can Med Ed J.* 2021 Sep;12(4):1. <https://doi.org/10.36834/cmej.73532>
- D'Eon M, Thompson G, Stacey A, et al. The alarming situation of medical student mental health. *Can Med Ed J.* 2021;12(3), p.176. <https://doi.org/10.36834/cmej.70693>
- D'Eon MF. Knowledge loss of medical students on first year basic science courses at the University of Saskatchewan. *BMC med ed.* 2006 Dec;6(1):1-6. <https://doi.org/10.1186/1472-6920-6-5>
- Mateen FJ, D'Eon MF. Neuroanatomy: a single institution study of knowledge loss. *Med Teach.* 2008 Jan 1;30(5):537-9. <https://doi.org/10.1080/01421590802064880>
- Greb AE, Brennan S, McParlane L, Page R, Bridge PD. Retention of medical genetics knowledge and skills by medical students. *Gen Med.* 2009 May;11(5):365-70. <https://doi.org/10.1097/GIM.0b013e31819c6b2d>
- D'Eon M, Crawford R. The elusive content of the medical-school curriculum: a method to the madness. *Med Teach.* 2005 Dec 1;27(8):699-703. <https://doi.org/10.1080/01421590500237598>
- Smith M, Weinstein Y. Six strategies for effective learning. *The Learning Scientists Blog.* 2016. Available at <https://www.learningscientists.org/blog/2016/8/18-1>. [Accessed on Feb 20, 2024].
- Van Merriënboer JJ, Sweller J. Cognitive load theory in health professional education: design principles and strategies. *Med Ed.* 2010 Jan;44(1):85-93. <https://doi.org/10.1111/j.1365-2923.2009.03498.x>
- Green ML, Moeller JJ, Spak JM. Test-enhanced learning in health professions education: a systematic review: BEME Guide No. 48. *Med Teach.* 2018 Apr 3;40(4):337-50. <https://doi.org/10.1080/0142159X.2018.1430354>.
- Ahmed K, Patel A, Lingard L. Exploring the experiences of Canadian medical students with a background in the arts and humanities. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77005>.
- Schultz K, Cofie N, Braund H, et al. The hidden curriculum across medical disciplines: an examination of scope, impact, and context. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.75207>
- Bogaty C, Frambach J. The CanMEDS Competency Framework in laboratory medicine: a phenomenographic study exploring how professional roles are applied outside the clinical environment. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77140>
- Bitektine E, Hintermayer M, Chen A, Ko A, Rodriguez C. Medical students' perceptions on preparedness and care delivery for patients with autism or intellectual disability. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.76338>
- Maxwell E, Sheppard G, Yi Y. A survey of undergraduate medical students' knowledge and attitudes about gender bias: the Newfoundland and Labrador perspective. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.75919>.
- Wiper-Bergeron N, Adam HL, Eady K, Moreau KA, Kennedy CR, Kendall CE. Extending social accountability mandates to biomedical research in Canadian faculties of medicine. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.75425>.
- Bondok M, Bondok MS, Law C, Nathoo N, Damji KF. Trends in ophthalmology applicants going unmatched in the Canadian Resident Matching Service. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77287>.
- Lin JC, Shin C, Greenberg PB. The impact of the medical school admissions interview: a systematic review. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.76138>.
- Dhara A, Fraser S. Five ways to get a grip on teaching advocacy in medical education: the health humanities as a novel approach. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.75274>.
- Larouche P, Sweeney K, Lajeunesse J. Medical escape games: experimenting with a new teaching method. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77290>.
- Moon H, D'Eon M. A practical model of faculty development in medical education: make it accessible, versatile, and easy to use! *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77076>.
- Sivakumar A, Willows K, Behroozan S, Stairs J. A multilingual sexual and reproductive health animation: a novel educational tool for newcomer patients. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77475>
- Pur DR, Samuel A, Sothivannan A, Tanya SM, Nguyen AX. Perspectives on a virtual student-led research conference in ophthalmology. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77019>
- Waisberg E, Ong J, Masalkhi M, et al. Apple Vision Pro and the advancement of medical education with extended reality. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77634>.
- Ruparelia S, Nguyen D-D, Nguyen AX. The utility of the MD extension program in Canadian medical education. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77791>.

25. Mahayosnand PP, Ahmed S, Mora Bermejo D, Sabra Z. COVID-19 lessons learned: public health research should be integrated into medical school curricula. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77594>
26. Moustafa K. Dismantling discrimination through education. *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77999>.
27. Prazeres F. Responses to “On the advantages and disadvantages of virtual continuing medical education: a scoping review.” *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.77943>.
28. Cheng C, Papadakis J, Umakanthan B, et al. On the advantages and disadvantages of virtual continuing medical education: a scoping review. *Can Med Educ J.* 2023;14(3):41-74. <https://doi.org/10.36834/cmej.75681>.
29. Neufeld A. A few comments on “Let food be thy knowledge gap: the lack of nutrition education in medical curricula.” *Can Med Ed J.* 2024;15(1). <https://doi.org/10.36834/cmej.78784>.
30. Esmonde-White C. Let food be thy knowledge gap: the lack of nutrition education in medical curricula. *Can Med Educ J.* 2023. <https://doi.org/10.36834/cmej.76390>.
31. Yaghy A. From curiosity to cure. *Can Med Educ J.* 2024;15(1). <https://doi.org/10.36834/cmej.78189>.