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[Aller au sommaire du numéro](#)

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## The productivity paradox in postgraduate medical education: improving asynchronous learning

Le paradoxe de la productivité dans la formation médicale postdoctorale : améliorer l'apprentissage asynchrone

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Online modules are increasingly used to impart learning material in postgraduate medical education (PGME). Advantages include self-directed learning, flexible scheduling, remote participation, and improved access to curriculum content. However, asynchronous learning may be at risk of the productivity paradox. This concept refers to the rapid information technology developments of the 1970s and the corresponding yet paradoxical decrease in worker productivity perceived over the same time. As more online modules are integrated into PGME, the extent to which this integration is productive may also paradoxically decrease.

In isolation, asynchronous learning in medical education is associated with improved knowledge and confidence with learning material, as well as high satisfaction with the delivery system itself.<sup>1</sup> Head-to-head comparison of in-person versus virtual learning demonstrates comparable academic outcomes, but greater satisfaction with face-to-face learning.<sup>2</sup> In cross-sectional comparison of online, offline, and blended learning approaches, blended strategies demonstrate significantly higher exam scores and pass rates than either online or offline approaches alone, while also being the majority of students' preferred learning modality.<sup>3</sup> In practice, variable degrees of in-person, virtual, and flexible learning models are used at medical schools in wake of the pandemic without clear consensus for optimal approach.<sup>4</sup>

Asynchronous learning by itself is not the issue. However, as progressively more learning material is delivered through online modules, they may breach critical mass for effectiveness due to accumulated volume. For instance, the four hospital networks within which we participate during postgraduate Year 1 conduct onboarding requirements almost entirely via asynchronous learning. Additionally, three separate courses in our residency program are delivered as online modules.<sup>5</sup> Eight modules are also required for all residents to register with the College of Physicians and Surgeons of Ontario, as well as nine separate PGME modules, prior to commencing residency. Individually, these modules are well-constructed and efficient means of presenting important information helpful for resident to learn. However, without proportionate time allotted for required learning, there is increased time burden and decreased attention to the importance of each module.

The burden resulting from increased module volume incentivizes learners to develop strategies that facilitate faster completion of asynchronous learning rather than engaging with the material. One such strategy is a phenomenon we define as "power-clicking." Here, participants click buttons to proceed through a module without reading the content so that they may complete the module in a shorter timeframe. Some asynchronous coursework adapts to this by requiring participation with animated material before clicking "next," or incorporating

a timer that precludes advancement without spending requisite time on a page. However, by virtue of creating these measures, it highlights the larger problem of why participants “power-click” at the outset. Isn’t the point to learn something and not just to complete the modules?

Furthermore, when individual organizations within the same PGME program deliver their own proprietary asynchronous learning on similar topics, it leads to redundancy. These include modules on subjects such as hand hygiene, electronic medical record systems, and personal protective equipment. Understandably, this is to ensure that learners are competent with crucial requisite onboarding material. However, repetition of similar modules for different organizations is superfluous and discouraging. Unfortunately, the burden of redundancy is placed on the learners rather than the implementing organizations.

Asynchronous learning fatigue may therefore be reduced by optimizing redundancy in repeat material among different organizations under a common postgraduate system. In addition, the applicability of PGME-wide courses may vary from program-to-program. This may be addressed by making certain modules supplementary for completion, thereby allowing residents to “opt-in” to modules that suit their program’s unique learning needs. When considering new modules for development, evidence shows that targeted selection of blended learning models combining in-person and e-learning may yield optimal results.<sup>3</sup>

In summary, asynchronous learning can be an effective tool for medical education when sufficient time is allotted for completion. Unfortunately, the current growth of online modules may breach critical mass, resulting in the productivity paradox. We outlined how learners develop strategies to adapt at the expense of learning itself in wake of the volume and redundancy of material. Solutions include reducing redundancy, identifying modules amenable to supplementary completion, and combining in-person and online approaches. In doing so, we hope that postgraduate learners may derive the full value of their learning, asynchronous or otherwise.

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