# The Productive Engagement SPACE: A Guide to Improve Critical Learner Interactions in e-Learning Environments

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## Introduction

While online education has been growing in prevalence since the 1990s,[1] the COVID-19 pandemic has brought about a fundamental shift in how we view education delivery.[2] We speedily transitioned traditional educational structures to online learning formats in an effort to reduce in-person contact during early 2020 when the pandemic first struck, changing graduate medical education (GME) in many jurisdictions seemingly overnight. Anecdotally, we learned that abrupt transition created a significant amount of confusion and consternation among residency educators, as well as among higher education teachers around the world. Now that we are more than 2 years into the pandemic, we must become more thoughtful, systematic, and deliberate in our strategies for designing online educational experiences.

One approach to curriculum design is backward design,[3] in which educators examine what is needed to achieve particular learning outcomes, and then build enabling attributes into educational structures, rather than waiting for program evaluations to identify problems. As we would for in-person experiences, being intentional and thoughtful about online education will enhance residents' experiences. While there are several good models for integrating technology into learning environments (eg, Substitution Augmentation Modification Redefinition [SAMR] model,[4] Technological Pedagogical Content Knowledge [TPACK] framework[5]), there are few comprehensive frameworks for online educational design.

The Social & Personal—Activity & Assessment—Digital Corridor—Education Delivery (SPACE) framework considers 3 critical learner interactions across these 4 domains: Learner-Learner, Learner-Material, and Learner-Educator. We developed this new approach as a team of 3 career educators and 1 clinician educator, all of whom identify as digitally oriented faculty developers. We then refined it with end-user feedback, including trainees, clinical teachers, and other faculty developers via multiple presentations in local, national, and international venues.

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*Editor's Note: The online version of this article contains supplementary data that describes common online educational challenges encountered by faculty members in development efforts of this study.*

## The SPACE Framework

SPACE is an organizing framework that considers key aspects of online teaching and learning (FIGURE 1). Each element of the learner journey differs in its contributions to essential learning interactions, indicating that domains of the SPACE framework vary in relevance throughout the learning experience.

These domains include (1) Social & Personal elements to replicate human connectivity (Learner-Educator; Learner-Learner); (2) Activity & Assessment tools to facilitate and measure learning outcomes (Learner-Material); (3) Digital Corridor (online communication channel/space) for intersections of critical learner interactions to take place (Learner-Educator; Learner-Learner); and (4) Education Delivery platform to support asynchronous and/or synchronous interactions among educators, learners, and materials (all 3 types of interactions).

The TABLE provides the purpose and benefits of each domain in the framework and possible techniques or tools that educators can use. Since the SPACE framework leverages features of techniques and tools to fulfill domain requirements, the framework remains relevant as new techniques and tools emerge. Several prompting questions included in the TABLE support the appropriate categorization of emerging techniques and tools to different SPACE domains. While it is challenging to incorporate effective learner-to-learner asynchronous online learning environments, it is essential to recognize that low or

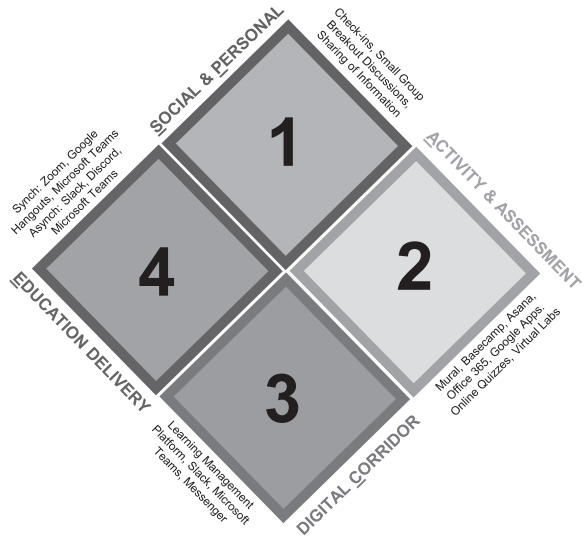


**FIGURE 1**
The SPACE Framework
Abbreviation: SPACE, Social & Personal—Activity & Assessment—Digital Corridor—Education Delivery.

nonexistent learner-to-learner or learner-to-educator activities fuel disengagement. Peer evaluations, study groups, group projects, and short welcome videos can be highly effective in creating *productively engaging* asynchronous online learning environments.

We will discuss the 4 SPACE domains to maximize future online learning experiences. This framework aims to enable *productive engagement* in online educational settings.

## 1. Social & Personal (Connection)

It is easy for educators to turn a blind eye to the social and personal domain in the digital world. In-person educational sessions inherently include opportunities for social connections, which occur when following up on questions or talking about unrelated topics. While not directly related to learning outcomes, this domain encourages social cohesion[6] and community development through behavioral and emotional engagement. In the online environment, educators must intentionally develop mechanisms.

***How Do You Create Social & Personal Connection Opportunities?*** Two potential ideas that we have:

- **Design social time into your schedule.** Plan 5 minutes before or at the end of a session for "chit chat" to foster connections.
- **Create virtual office hours.** Plan for set times when you can be available for interactions with learners as needed. You may also consider broadening this drop-in session to encompass career guidance or other advice.

## 2. Activity & Assessment (Productivity)

Current online platforms provide diverse activity and assessment options that enable learners to engage productively in their learning as well as demonstrate their productivity. These are available in synchronous and asynchronous formats. While synchronous activities and assessments require a time commitment and advance scheduling, asynchronous activities and assessments provide flexible approaches for interactions and collaborative work. Pairing the course learning objectives with activities and assessments supports active use of the tools you choose to include in the course.

***How Do You Use Activity & Assessment Tools?*** The following are 2 ideas:

- **Create a blog post using Google Docs.** Educators can create and share Google Docs with learners, and the learners can use them to draft their first post for a given topic. Faculty members may then use version history to assess individual contributions (if desired).
- **Assess learning as you go.** Whether you are doing synchronous or asynchronous education, progress testing[7] that does not contribute to "final grades" can be included throughout the learner experience.

## 3. Digital Corridor (Accessibility)

The *digital corridor* provides an accessible space for resident-learners and educators to connect asynchronously. It is a closed (ie, usually not publicly available) social media platform that combines all components of the learner's journey. This space is relevant regardless of how short or long the educational experience is; however, it is especially critical for longer durations to maintain connections. The digital corridor may be a university-mandated learning management system (eg, Blackboard). However, it may also include chat-based platforms (eg, WhatsApp, Facebook Groups, Twitter) or a team-based closed communication system (eg, Microsoft Teams, Basecamp, or Slack), especially when privacy and security concerns may exist with the use of a personal phone number on WhatsApp or a personal account on Twitter. Closed social networks (eg, Moodle, Slack, Doximity) are increasingly popular in higher education.[8] It is important to understand learner comfort and preferences. A clear set of expectations

**TABLE**
SPACE: Social & Personal—Activity & Assessment—Digital Corridor—Education Delivery

| Framework Domain | Purpose and Benefits | Possible Techniques | Possible Tools |
|---|---|---|---|
| **Social & Personal**<br>*Does this facilitate social connectivity through either synchronous or asynchronous interactions?*<br><br>*Does this method encourage 1:1 or 1:many interactions between learners and/or educators?* | Humanize your virtual and online teaching by making space for social and personal elements.<br><br>Harness this component to support learner performance and increase the likelihood of identifying a learner or participant displaying "at risk" or "disengagement" behaviors early on. | Large class: Reserve 5 minutes for learners to write in the Zoom chat what TV show or movie they have most enjoyed this week.<br><br>Small class: Check in with everyone individually about something fun they have done this week. | No technology required: short introductory games, improv activities, or virtual rituals.<br><br>Technology required: online quizzes or polls (eg, Kahoot) on fun topics, screen share to play bingo, or jeopardy. |
| **Activity & Assessment Tools**<br>*Does this enable nonverbal and verbal styles of collaboration?*<br><br>*Does this provide ways for learners and educators to understand their performance in a low-risk setting?* | Augment your curriculum delivery with activity and assessment tools that facilitate learning and experiential outcomes.<br><br>Include assessment tools that measure learner performance, participation, and engagement. | Blend multiple interaction modalities for increased engagement, such as Google Docs or Jamboard (written collaboration) with Zoom (verbal collaboration) to facilitate concurrent engagement possibilities. | Multi-tool platforms: Google Suite, Microsoft OneDrive, Mural, Miro. |
| **Digital Corridor**<br>*Does this permit asynchronous and synchronous conversations (or interactions) about course materials as well as social elements?* | Connect learners with peers, course material, and educator(s) to minimize friction in online learning experiences.<br><br>Mimic between-class conversations; facilitate collaboration or study group formation.<br><br>Encourage engagement in course material and with the educator(s) through co-location with peer access and interactions. | Allow easy access for educators and senior trainees (eg, chief residents, teaching assistants, etc).<br><br>Engage with learners in asynchronous and continuous question and answer forums.<br><br>Share additional resources and facilitate interactions during Social & Personal activities. | Multiple uses: Microsoft Teams, Slack, Basecamp, learning management system<br><br>Single engagement style: WhatsApp, Signal Private Messenger app, Facebook Messenger, Twitter (if a specific unique hashtag is used) |
| **Education Delivery**<br>*Does this connect learners with the course materials in an accessible, organized, and predictable fashion?*<br><br>*Are there mechanisms to ensure equity regarding access of materials (eg, due to time zone or internet connectivity considerations)?* | Consider how education will be delivered. The educational delivery may be in-person, online, or a blended/hybrid model. It may be synchronous or asynchronous. Each modality has different engagement opportunities.<br><br>Consider platforms that integrate other domains of the SPACE framework. | Face-to-face place (eg, video, chat, teleconference)<br><br>Library of asynchronous resources (eg, video archive, podcasts, repository of papers)<br><br>Asynchronous continuous chat (eg, Slack-based discussion, WhatsApp debate) | Synchronous platforms: Zoom, Microsoft Teams, WebEx<br><br>Video archives: YouTube, Vimeo<br><br>Learning management software: Moodle, Brightspace, Blackboard<br><br>Discussion forum via chat programs (similar to above tools in the Digital Corridor but for a curricular purpose) |

for correspondence should be shared upfront with all community members.

*How Do You Establish a Digital Corridor?* Some ideas include:

- **Create a Slack workspace for communication and collaboration.** For example, create a workspace for a residency program with channels entitled #random-musings, #life-and-social, #need-help, and #congrats-thanks-brags. Over time trainees and faculty members naturally start posting queries about childcare advice queries (#need-help), online hangouts (#life-and-social), and congratulations for publishing papers (#congrats-thanks-brags). They even start asking each other for advice on fun books to read in #random-musings.
- **Create a WhatsApp group to maintain connections.** For example, create a group for faculty members to connect between faculty development sessions, allowing them to continue engaging in conversations or ask random questions.

#### 4. Education Delivery (Place)

Educational content is essential for online learning and is often delivered through several modes, such as multimedia or text. Education content should align with the delivery method and can be provided using either synchronous or asynchronous approaches.

*4.1. Synchronous (Face-to-Face) Delivery:* It is challenging to replicate in-person meetings due to a combination of verbal and nonverbal communication techniques (eg, eye contact, gestures, facial expressions, sighs). In online learning environments, video conferencing tools (eg, Zoom, Microsoft Teams) can be used to facilitate education delivery. High-quality video and audio with low latency and lag often create a more immersive experience for participants. Many tools are available for free and can be selected based on learning environment requirements, such as group size and ability to screen share or moderate discussions, as well as other needs: advance scheduling, breakout rooms, activities, and assessments.[9] The TABLE maps the SPACE domains to their uses in education and then matches them to technological tools.

*4.2 Asynchronous Content Delivery:* Asynchronous delivery can occur through discussions or archives of previously recorded content. Learning management system discussion forums are often used for asynchronous communication within courses housed on these platforms. While many of us consider text messages a standard part of modern communication, social media tools for asynchronous discussions have been used less often in higher education, though they are now increasing in use.[8] Asynchronous resources for curriculum delivery need not be derived new by faculty members; instead, educators should be encouraged to select content from resources already created. Libraries of resources already exist, and building upon the prior digital scholarship of others is critical to respect the contributions of other scholars in our fields.[10]

## Implementing SPACE in Your Program

The SPACE framework serves as a proposed tool to support the development of new online learning experiences and convert existing in-person learning experiences to an online setting. Online learning environments must incorporate flexibility, facilitate interactions, encourage ongoing engagement, and foster a learning climate aligned with underlying learner motivations.[11] Integrating all 4 domains across a learner's journey (FIGURE 2) is essential to provide a rich educational experience while minimizing cognitive complexity that may reduce *productive engagement*. By integrating asynchronous and synchronous interactions across the 4 domains (FIGURE 1), educators are encouraged to thoughtfully design learner experiences to address critical learner interactions that may have been missing during the pandemic. Based on our experiences, we also developed the SPACE audit tool (FIGURE 2), which can be used for self-evaluation of online course development to identify potential areas for improvement. High performance across all SPACE domains may yield more enduring learning.

The online supplementary data describes common online educational challenges we encountered by faculty members in our development efforts. We outline a possible solution aligned with the SPACE framework for each challenge.

## Barriers and Limitations

Potential barriers to creating optimal online learning environments include understanding the key pedagogical differences from in-person learning, being familiar with successful examples, and adapting to learner needs that can evolve over time. Many faculty members are not familiar with new techniques and tools for online education. Similarly, residents and faculty are unaccustomed to being active participants in online learning environments. When attempting

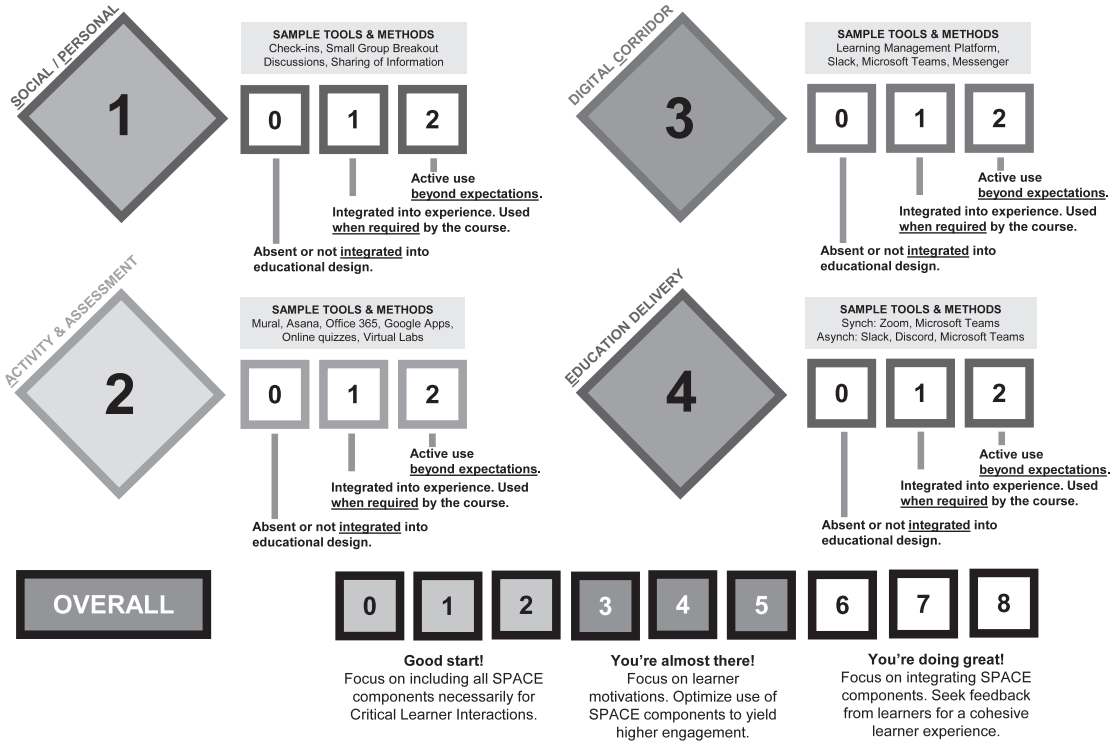


**FIGURE 2**
SPACE Audit Tool for Educators to Assess Online Learning Experiences
Abbreviation: SPACE, Social & Personal—Activity & Assessment—Digital Corridor—Education Delivery.

new techniques, educators need to build in time for orientation and questions.

## Conclusions

We foresee that digital engagement will be an essential component of many future work environments, including academic medicine. While we anticipate most GME environments will revert to live experiences, we caution against doing so, especially in the GME setting. We believe that there are several advantages to online educational experiences, including increased accessibility, multi-channel experiences, and collaboration opportunities. We hope the SPACE framework and audit tool can help educators create blended or online experiences to better train our learners to be more effective health care communicators and collaborators, prepare them for the digital world, and augment in-class activities.

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