

## Background and Rationale

**The clinical model.** Health professionals understand that each person is unique and that clinical care needs to adapt to their individual differences. As clinicians, we routinely individualize our diagnostic workups, propose personalized care plans, keep careful records of progress, remain continuously diagnostic, revise our recommendations and plans repeatedly, as needed, and seek to empower patients to take maximum possible responsibility for their own care.

As educators, shouldn't we be adapting to the individual differences among learners, and shouldn't we be helping learners direct and shape their own learning as fully as they can? The evidence is clear: all learners have a unique combination of prior life and learning experiences, cultural heritage, beliefs, assumptions, communication skills, relationship styles, "brain maps", and more. They perceive the world through a unique set of filters. Learning experiences that are standardized and pre-prescribed, that don't adapt to individual learners' characteristics and needs, are at risk of being seriously sub-optimal.<sup>1</sup> Fortunately, approaches and technologies are now available that enable us to offer Adaptive Education (AE) effectively and economically. Appropriately used technologies can make several contributions to the educational process: it can directly provide parts of learning experiences, it can help orchestrate resources that support learning, and, we anticipate, it has the potential for helping reduce the costs of education.

**iMedTrust's approaches.** In our design, AE involves determining and responding appropriately to every medical student's unique baseline and evolving characteristics in all aspects of our educational offerings. We need to understand learners sufficiently to make appropriate, individualized adjustments to our expectations, while helping them take increasing responsibility for achieving the program's and their own desired outcomes. Learning is optimal when individuals are fully invested in the process. At its core, AE needs to promote and support authentic engagement.

AE can embrace a wide range of experiences. At one end are the moment-to-moment reactions of educators as they work with learners, or the responses of digitally-based learning resources while interacting with individual learners. At the other end, AE can define the essence of a medical school's entire curriculum, as it does for us. A key component of AE involves being continuously "diagnostic". This requires an educational process that shifts from being dominated by "telling" and "showing" to one that mainly involves "asking", "encouraging", and observing. Ultimately, learners need to do their own, active learning.

In patient care, gathering full, accurate information requires a trust-based relationship. Similarly, earning and sustaining our learners' genuine trust is a foundational need of AE. Being fully helpful to learners requires us to have access to each learner's candid thoughts and feelings.

Adaptive Education (AE) is iMedTrust's primary area of educational innovation and contribution. It will be a centerpiece of our educational programs. Our version of AE embraces a set of ideas, strategies and resources that respond to the substantial evidence that each learner is unique. We are persuaded that to be optimally effective, learning experiences must adapt as fully and as continuously as possible to the unique characteristics and evolving readiness of each learner, whether working alone or in groups, as they need to for fulfilling some of the important goals of

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<sup>1</sup> In an important sense all learning is adaptive, since all learners, inevitably, shape what they perceive and absorb according to their unique characteristics. When those characteristics are unknown or ignored, the learners' outcomes are unpredictable and may be undesirable.

medical education. These premises are the foundation of iMEDTrust's curriculum. In our program, AE has two main levels: a) The overall educational program; and b) Each of the individual sets of "Learning Experiences" in which students engage.

iMEDTrust's educational program includes multiple components, all of which are important and relevant to AE:

1. Carefully selected students, who show promise as health professionals, and as future leaders
2. Carefully selected, well-prepared educators (who we will help prepare)
3. A systematic focus on helping our students become and remain "**mature learners**"<sup>2</sup>
4. Appropriately designed and actively used educational-support technologies
5. A system that continuously identifies and adapts to each individual student's current and changing capabilities, characteristics, and learning needs.
6. Provision for each learner to follow optimally individualized, evolving learning pathways, to the extent possible, within our available resources.
7. An arrangement that encourages and enables learners to continuously review their own progress toward their expected outcomes. Their reviews are guided by their self-assessments, regular consultations with their mentors and facilitators, and by routinely checking the systematic records accumulated by our **AEMS** (Adaptive Education Management System). These records describe the experiences in which they've participated and their performance during their participation in their various "Learning Modules" (see below), in their **CLGs** (collaborative learning groups<sup>3</sup>), their simulated and real clinical and research experiences, as well as when engaging in Learning Tasks, while using our AEMS.

Learners will be continuously helped to understand how they are doing in their efforts to fulfill or exceed the three sets of outcomes that guide their learning (the outcomes required by the regulators, the additional outcomes expected by iMEDTrust, and any additional outcomes that they want to pursue, which we consider consistent with our mission and supportable by our available resources). To the extent feasible, learners will move through the program at a pace that is appropriate for their capacities and levels of readiness. That is, they will reach each of the "**thresholds**" ("milestones") that are needed on their way to the **Outcomes** required for their graduation and registration as doctors. The enabling and ultimate outcomes will be considered reached by the learners' demonstrated achievements, not by arriving at a pre-selected date on the calendar (within reasonable limits).

This ambitious educational program will be supported by current technologies, which will enable us to orchestrate the learners' schedules, resources used, and learning **pathways**. Our approaches are designed to improve learning effectiveness and economic efficiency, and to provide a platform that can be adopted and adapted at zero or low cost by members of the iMEDTrust Network, primarily in the "**Global South**", and at reasonable cost by others.

(NOTE: We are not aware of any existing program that has implemented a program that is even close to the full example of AE that we are planning. So, we don't feel our program can be pre-judged by comparison to others that are currently underway. We ask, instead, to be judged by the reasonableness of our ideas and their consistency with available evidence from psychological, educational and brain sciences. Please see next for some additional explanations and definitions.)

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<sup>2</sup> Words and phrases in bold, green will be hot links to definitions in our Glossary on our web site.

<sup>3</sup> Where students learn medically relevant content and processes as well as the skills of effective team participation

## The Elements of Educational Adaptation in the iMedTrust Programs

Our Adaptive Education program involves customizing each learner's experiences to an optimal extent. In general, we consider an optimal learning program to be one in which four key elements are as flexible as possible. That is, these elements can be adapted, even fine-tuned, as needed. They are: Learning Modules; Learning Experiences; Learning Tasks; and Time. A fifth element is also central, but not nearly as flexible: The 5<sup>th</sup> element is the **Outcomes** being pursued. The Outcomes being sought through our educational programs are mainly non-optional; they are mandated by the regulators. Our primary regulator is the **GMC** (General Medical Council). In addition, each student will pursue outcomes that we choose to add to the GMC's set,<sup>4</sup> and others that each student may optionally choose.

The process of Adaptive Education in our program involves matching our four main, adaptable elements of learning to the identified needs and readiness of each individual learner. The following are the main characteristics of each of these four key elements. (See Figure 1, below for a diagrammatic representation of the ways the three main learning elements interact, and Figure 2, at the end, for a diagrammatic overview of an example of Adaptive Education's operation in our overall curriculum.)

### Learning Modules

Modules are collections of **learning experiences** undertaken by learners over the course of one term (each term is 14 weeks; with 3 terms per year). Typically, a student will pursue 2-3 Modules in a term. Each Module is supported by multiple, interrelated Learning Experiences. Together, these learning experiences support the development of desired **threshold capabilities**, which, together with other modules, build toward the program's required and desired, ultimate learning **Outcomes**.

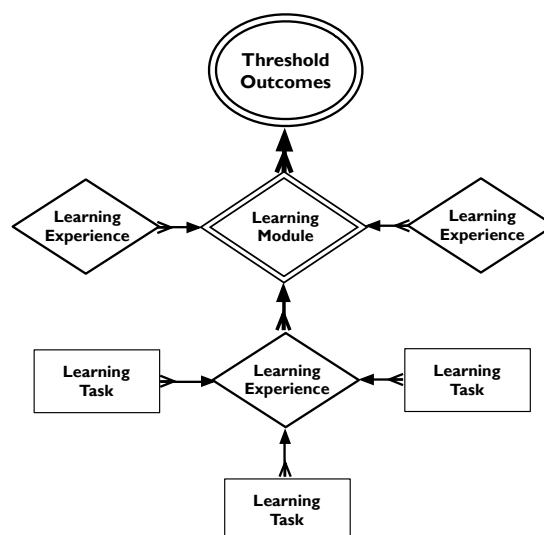
### Learning Experience

Learning Experiences are comprised of fairly brief events (usually not more than a few days). They involve several coordinated Learning Tasks (see next), all focused on a sub-set of **enabling outcomes**, building toward the **threshold outcomes** intended for that Module. (For an illustration of a sample set of learning experience, leading to an ultimate outcome, see Figure 3, at the end.)

### Learning Tasks

Learning Tasks are explicit learning activities in which a student is engaged at any given time, such as interviewing a simulated patient in the Simulation Centre, or seeing a real patient in one of our clinics. Learning Tasks are usually self-contained. That is, they begin and end within a single time period (perhaps an hour, or a half or full day). Multiple Learning Tasks are coordinated to support the Enabling Outcomes intended for a given Learning Experience. Our main Learning Tasks will involve one or more of the following at a time: online simulations or other tasks; "live" simulations, (i.e., working with simulated patients or manikins, and/or other students); engaging in real clinical or

Figure 1



<sup>4</sup> Summarized in our view of the **21st Century Doctor**.

research experiences; participating in *Collaborative Learning Groups*; and custom-designed tasks, devised by a learner, usually in consultation with a mentor or other advisor.

### Time

In conventional education at all levels, time has been a dominant organizing variable (as it is in many other human activities). Time has the appeal of being understandable and accurately measurable. Except, time is inappropriate as an overriding basis for managing complex learning. When seeking to achieve simple outcomes, especially with mechanical tasks, such as building a machine, time can be a reasonable constraint to use. With complex human tasks, such as medical learning, as is true when managing a severe illness, choosing time as a dominant constraint violates what we know about human diversity and about the unpredictable and uncontrollable factors that shape the pace of progress. Yet, managing time in a complex learning environment is something of a balancing act.

The dominant constraint should be the ultimate outcomes of learning that are required and desired. Given the many differences among learners, it is unreasonable to expect all of them to achieve the same set of outcomes in the same amount of time. Yet, with the reality of economics as an additional, unavoidable constraint, time cannot be disregarded. The time needed for completing the program cannot be open-ended. Part of our response is giving an unprecedented level of attention to studying and improving the process of student selection. We anticipate reducing somewhat the extremes of the differences often found in cohorts of medical students. Our approach may narrow the range of total time needed for satisfactory completion of our program.

Even with our large investment in designing and conducting innovative approaches to student selection, we will have, and will welcome, a substantial amount of diversity among our students. (We are seeking students from widely different backgrounds, in part, to provide richer opportunities for students to learn from each other.) We accept that it is impossible to forecast exactly how much time to allow for all students to achieve the required and desired outcomes. On average, we expect that many of our students will successfully achieve their needed outcomes in approximately 4 years. Around that average amount of total time we will allow for a range in both directions: a possible maximum of up to six years, and down to whatever minimum amount of total time the regulators require (although we remain hopeful that they will understand the principle that demonstrably achieving learning outcomes provides a more appropriate determinant of completion than does an arbitrary, pre-decided amount of time).

### **An additional element that makes these innovations possible and affordable:**

iMEDTrust's Adaptive Education Management System (AEMS). As indicated, Adaptive Education<sup>5</sup> is the center of the iMEDTrust curriculum. Our AEMS is the technology-based resource that will provide the needed support of several critical functions of our educational program. The AEMS will:

1. Orchestrate the allocation of time, physical objects, space, personnel, and other resources that support many aspects of iMEDTrust's educational program;
2. Serve as the continuously growing collection of digitally-based, interactive resources (references, tasks, simulations, schedules, personal and social communication networks) that are the foundation of a large proportion of the students' individual learning experiences;

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<sup>5</sup> Sometimes, but not fully accurately, called differentiated learning or differentiated education.

3. Assemble the records of multiple aspects of each learner’s experiences, reflections, logs, and performance (as added to the system by the learners themselves, by their educators, supervisors, and peers, and as accumulated automatically by the system);
4. Manage the continuously changing offerings of tasks, resources, and suggestions that are uniquely adapted to learners’ requests, backgrounds, accumulating experiences, and other evidence of readiness and need each time they access the system;
5. Enable our facilitators, mentors, clinical supervisors and other educators to remain fully current regarding the experiences, accomplishments and difficulties of those students who they are supporting (and to whose records they are contributing);
6. Coordinate the electronically-based communication processes among members of the iMedTrust family, including the exchanges of private and social information;
7. Other functions that may evolve over time, based on our experiences and our ongoing systematic research related to others’ and our uses of the system.

**An important consideration when accumulating learner data.** As the world of education has become more attuned to the reasonableness of the concepts underlying Adaptive Education, and as progressively more information is being gathered about students, there is a growing awareness of the need to ensure the protection of student privacy. On 30 August 2015 [a report in the New York Times](#) drew attention to the growing amount of concern regarding student privacy protection in the face of increasingly detailed information being gathered about students in the US public education system. Another sign of these concerns, and as encouraging evidence of constructive steps being taken in response, the US National Science Foundation is funding [a multi-institutional project](#) to devise ways for both accumulating and protecting appropriate information about learners in higher education. iMedTrust is committed to always adhering to the highest possible standards in protecting both personal privacy and the integrity of all of its data.

**An historical perspective.** The following is one group’s visual synopsis of the historical evolution of Adaptive eLearning, which is one segment of Adaptive Education, as we are designing and implementing it. (For more, see “Smart Sparrow”, in our References list, Part B, below.)

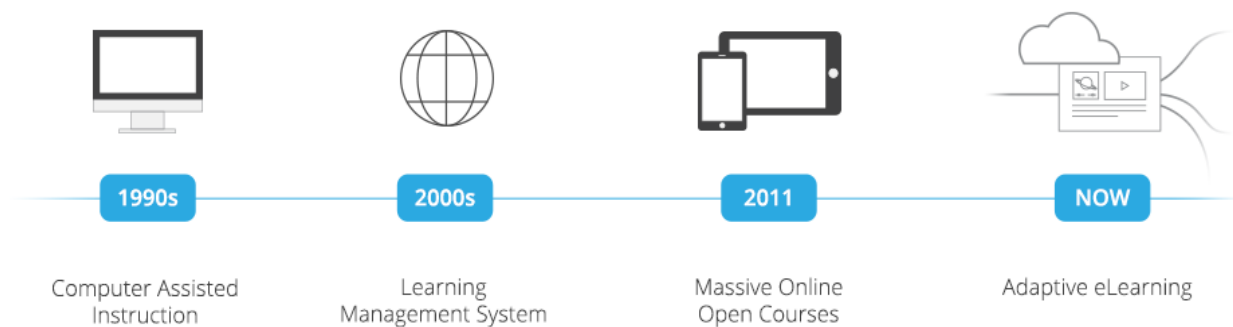


Figure 2

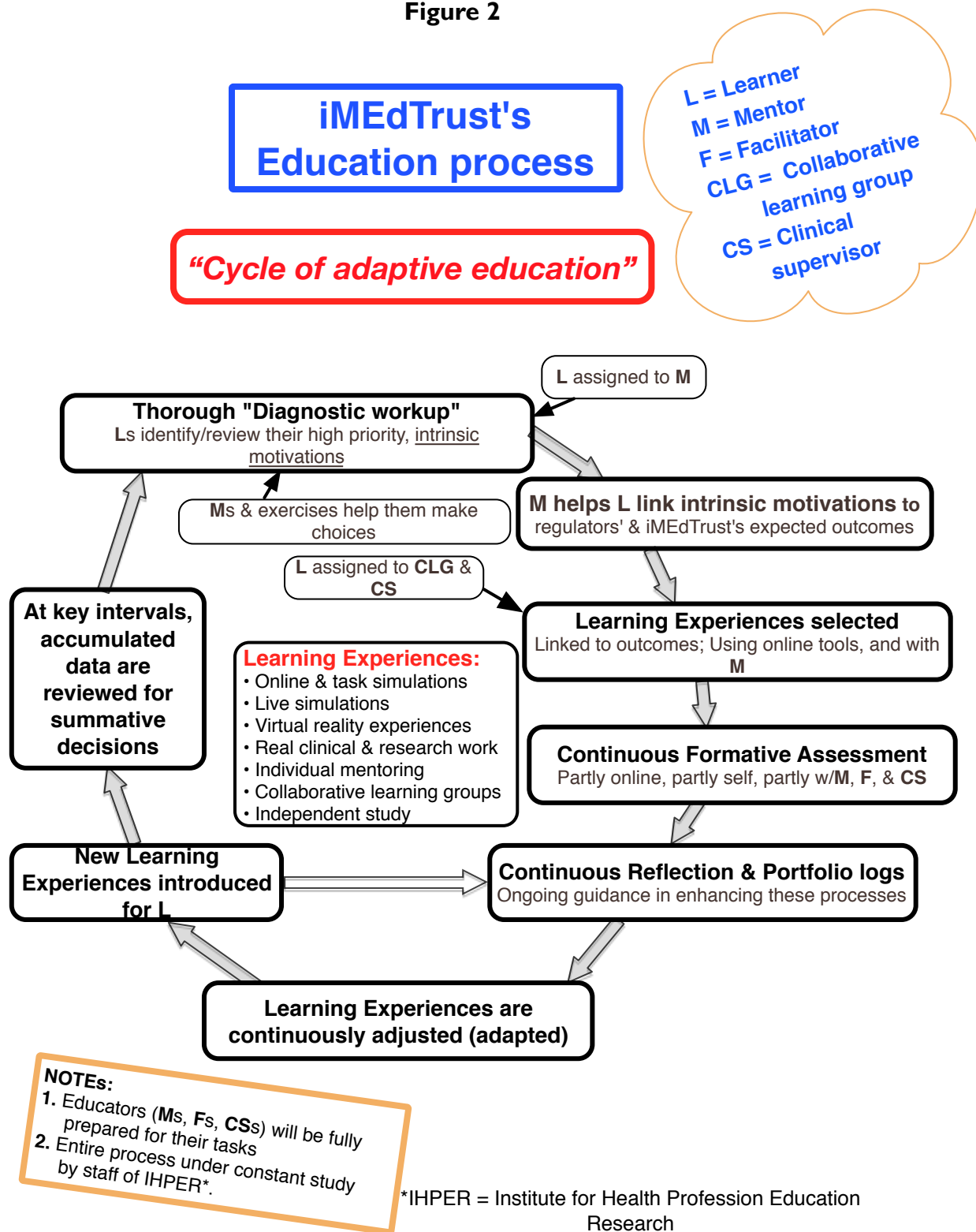
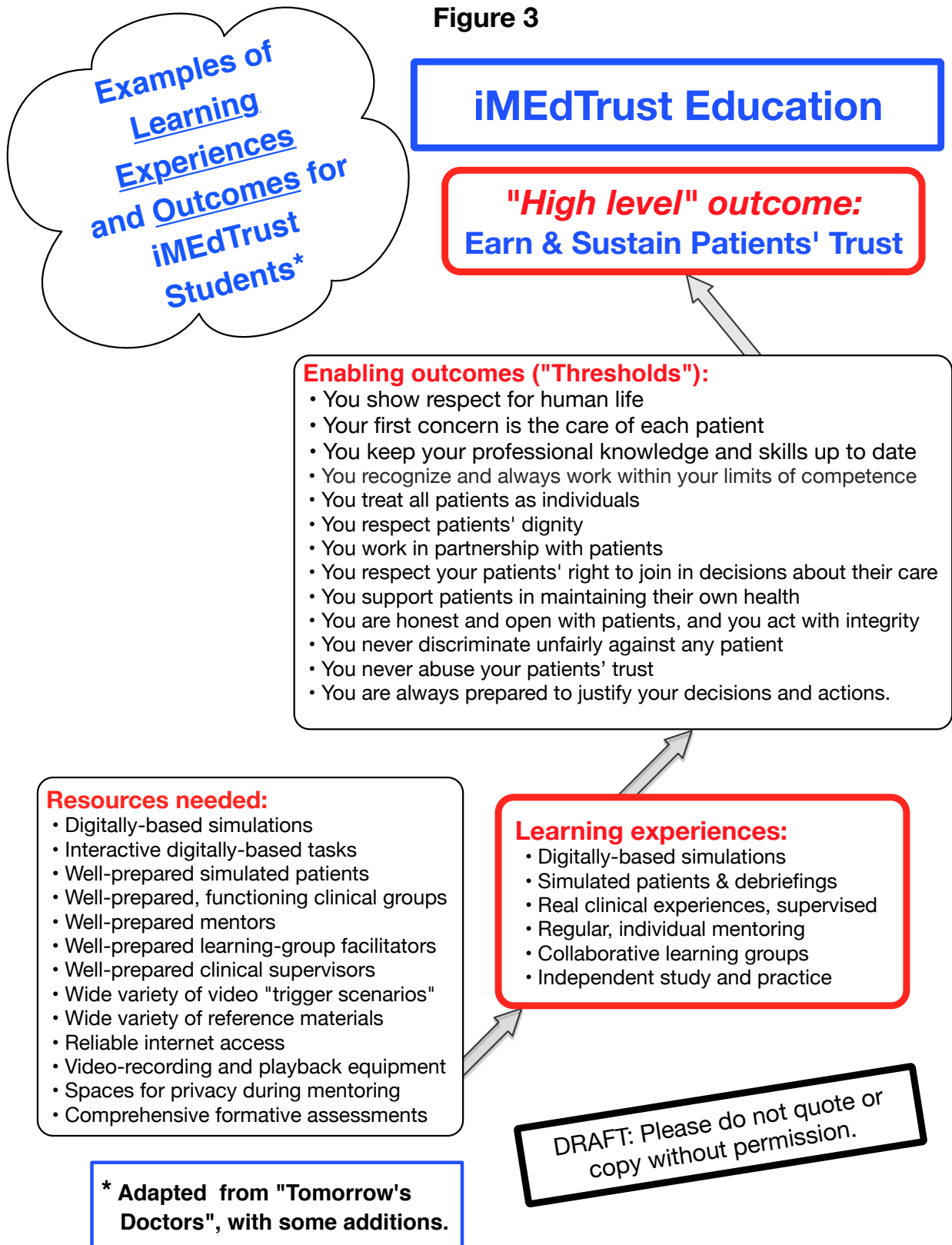


Figure 3



## Selected references to relevant information, ideas and research:

NOTE: We are not able to find any references in the literature that we consider directly relevant to our overall initiative. We've not been able to find any descriptions of, or research about, a program that is as comprehensive or as ambitious as we are pursuing. (We invite and welcome suggestions of references that we missed.) Still, we feel that our optimism about our plans and prospects is justified on the basis of the large number of indicators that many others sense the need for programs that move toward the directions we are traveling. Those programs that exist and are emerging are typically constrained by internal and external factors that reduce the freedom of the innovators to depart more than partially from the traditions that their institutions and influential individuals continue to value. As those of us involved in initiating the plans for iMEDTrust have experienced repeatedly over many decades, existing institutions tend to be populated with faculty members and administrators who are unwilling to move very far from educational approaches that are most familiar to them.

The following is a selected list of reports and summaries that provide some background to the initiatives we are pursuing, and that indicate the growing efforts to move medical and other educational programs toward the directions we are choosing to pursue.

### A. Selected publications by iMEDTrust staff and advisors (identified in bold)

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