# Curriculum Inventory in Context

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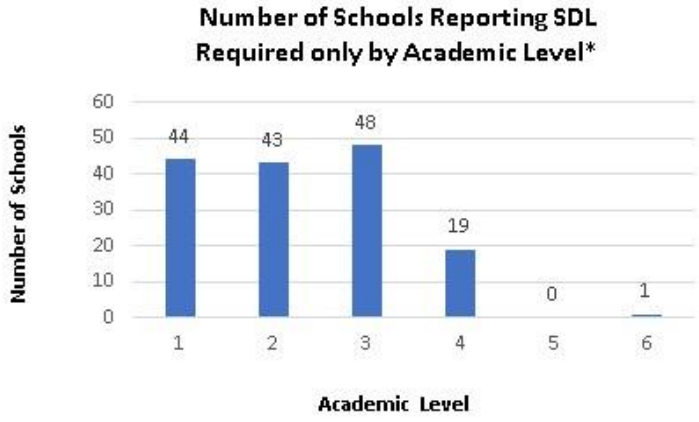
### Use of Self-Directed Learning in U.S. and Canadian Medical Schools

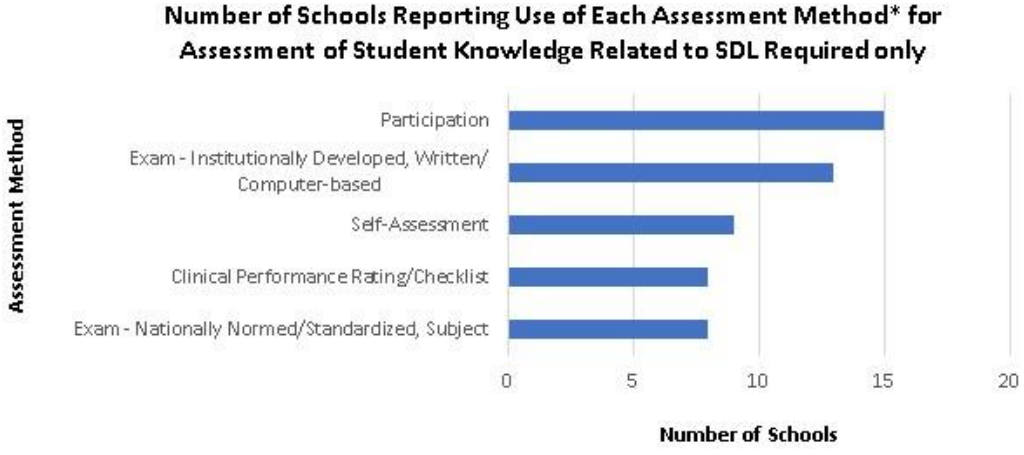
Utilization of self-directed learning (SDL) is integral to the successful implementation of the post-Flexner shift towards basic, clinical and social sciences content integration[1] and outcomes-based medical education[2]. SDL "helps the student to develop the capacity for self-reflection and lifelong learning," an essential skill for the development of a successful professional career[2]. Providing coaching and feedback on students' performance in SDL exercises helps students sharpen their metacognitive ability to assess their learning strategies and identify their knowledge deficits[3]. Nearly 60% of schools that participated in the Association of American Medical Colleges (AAMC) Curriculum Inventory (CI) for Academic Year 2016-2017 indicated a required SDL component as part of their curricula. Medical schools are including SDL primarily during early intervals of the curriculum (Table 1) and are utilizing a variety of methodologies to assess SDL (Table 2). Learner participation is the most commonly documented method used to assess SDL.

**Table 1.**




*Academic Levels are major progression intervals in the curriculum that do not necessary correlate to a 'curriculum year.'

**Table 2.**



The MedBiquitous CI Working Group, in partnership with the AAMC, defines SDL as "learners taking the initiative for their own learning: diagnosing needs, formulating goals, identifying resources, implementing appropriate activities, and evaluating outcomes."[4] LCME Element 6.3 on Self-directed and Lifelong Learning explains SDL "involves medical students' self-assessment of learning needs; independent identification, analysis, and synthesis of relevant information; and appraisal of the credibility of information sources."[5] At Zucker School of Medicine (SOM) at Hofstra/Northwell, we have extended this definition to include individuals' identifying persistent knowledge gaps after initial context exploration and discussion, generating action plans to fill them and closing the loop on outstanding learning needs via accountability for action plans. Throughout the past eight years, we found this important addition to the LCME framework to be necessary for successful SDL. It helps our learners reflect upon their learning and implement behavioral changes to continue the cycle of SDL. These definitions of SDL are in contrast to 'directed SDL', in which a portion of the SDL process is completed by educators rather than students, frequently via the prescription of learning objectives and/or resources.

The AAMC CI data for Academic Year 2016-2017 enables access to a wealth of data including types of instructional methods schools' use to support SDL (Table 3). Most frequently, SDL is being reported as its own instructional method. Lecture and independent learning are the subsequent two most frequently reported instructional methods with required SDL. SDL and independent learning together comprise just under half of all reported instances of SDL. This is encouraging because many of the other instructional methods listed likely represent directed SDL. The 2016-17 CI Report on SDL demonstrates the median number of SDL events per school is five per year, occurring in a median of three courses/clerkships. The maximum number of SDL events per school is 140, and the maximum number of courses/clerkships with SDL content is 40 (Table 4).

**Table 3.**

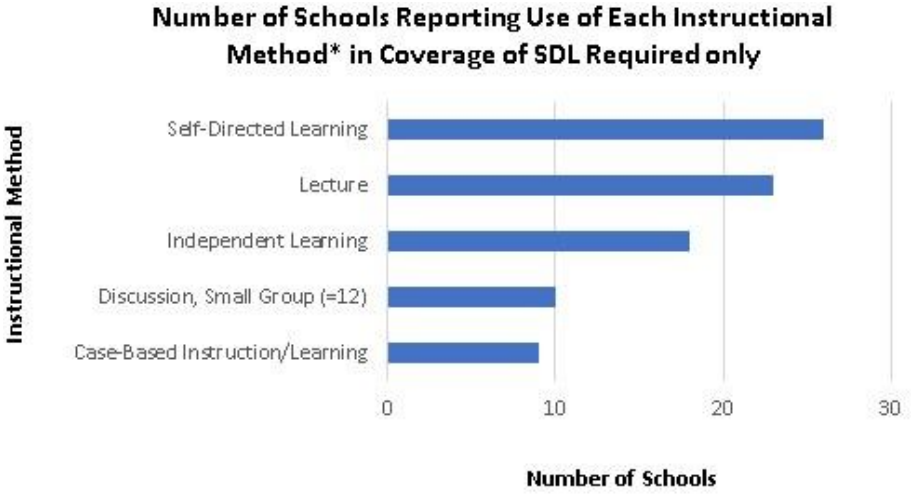
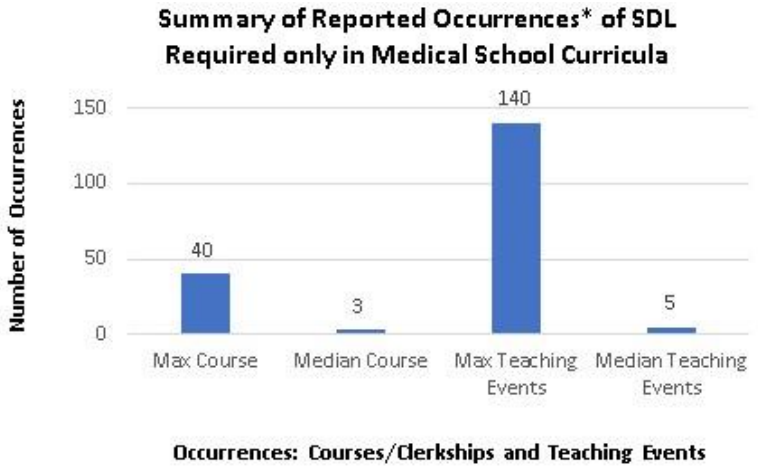


**Table 4.**




[a]Occurrences are courses (including clerkships) and teaching events (documented student learning activity).

Many educators are challenged by where and how to incorporate SDL into their curriculum. CI data shows that SDL is currently being incorporated into various instructional methodologies (Table 3). Herein we provide an overview of our approach to integrating both SDL and directed SDL as part of small and large group sessions, as well as laboratory and clinical experiences, during the pre-clerkship phase of the curriculum at Zucker SOM.

Our approach to utilizing SDL in small group has been as a unified sequence through our PEARLS (Patient-centered Explorations in Active Reasoning, Learning and Synthesis) program. PEARLS is our small group, hybrid problem/case-based learning program[6]. Three times per week throughout the first two years, students meet in small groups with a process facilitator, who is a physician or PhD scientist, who monitors group dynamics but does not provide or correct content. PEARLS employs authentic patient cases from which students identify their learning needs and develop learning objectives as a group. Each student is then responsible for researching every learning objective on her/his own (typically 6-8 hours per case) prior to the next session. Students independently identify resources from which they derive all information they bring to their PEARLS groups. Groups reconvene to synthesize their understanding of the material with their peers. To ensure learners engage in higher order discussions, they are required to prepare and present complex, higher-order problems to one another. These higher-order problems prompt their peers to integrate scientific and/or clinical concepts that might otherwise remain unconnected. This process typically involves students diagraming ideas on writeable classroom walls, projecting images or posed problems from their laptops onto a large screen, and forming smaller breakout groups to apply concepts to new situations and report back out to the rest of their PEARLS group. By developing higher-order problems, students learn to challenge their ability to independently analyze content, while presenting these problems results in peer teaching and deeper learning for all.

Students engage in directed SDL prior to each ZSOM Structure laboratory they attend, which integrates anatomy, histopathology, embryology, imaging, and physical diagnosis. During a Structure session students rotate through different stations in lab. Each station has a goal and learning objectives that students receive in advance of the lab. Students are responsible for satisfying the learning objectives for

all the stations prior to attending lab either through completion of the faculty assigned pre-readings or by using their preferred resources, which might include text, atlas, videos, or other resources.

For large group sessions, directed SDL takes place in the form of pre-work our learners complete prior to attending sessions. Faculty create goals and learning objectives for each large group session and assign pre-work (e.g., readings, videos). The purpose of pre-work is to allow learners to develop an understanding of the learning objectives prior to the session. During the large group sessions, faculty present application questions that require learners to synthesize concepts from the pre-work as they discuss problems and cases posed by faculty.

During pre-clerkship clinical encounters with patients, students engage in SDL by generating learning objectives that identify knowledge gaps related to the care of each patient. Students are then responsible for selecting their own resources, researching the information to satisfy their understanding of the learning objective, and discussing their findings with their supervising physician during weekly ambulatory experiences.

Throughout the pre-clerkship years, students receive formative feedback to coach their development of SDL skills during PEARLS. The need to hone SDL skills is reinforced by the summative assessment of content students are responsible for learning during SDL (e.g., PEARLS) and directed SDL. Summative assessment of the development of SDL skills is also part of each student's grade at the end of every course, all of which are pass/fail.

Through defined programmatic expectations, education, support for student development of skills, and clearly identified roles for students and faculty, we have established a successful culture of SDL. In this environment, students thrive as they acquire new knowledge and skills for lifelong learning as physicians.

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