Empowering Metacognitive Learning in a Competency-Based Curriculum in Health Professions Through Comprehensive Learner Record

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Abstract: Health professions education is in the midst of a radical transformation from traditional lecture-based teaching to competency-based learning. This requires an equally radical transformation in the way we assess student learning and achievement of competencies.

Comprehensive Learner Record (CLR) addresses this need, enabling metacognitive learning and reflection of student development of competencies as they progress through a curriculum. CLR helps students make sense of their various learning activities and share their educational journey with future employers, highlighting artifacts and achievements in personally curated portfolios.

CLR helps students synthesize learning, guides supplemental supports, and empowers program-level assessment to guide curricular improvements. Reflection and feedback at milestones provide a formative assessment to support progression. As nursing and other health professions schools transition toward competency-based learning, CLR provides an essential mechanism to communicate the achievement of core competencies as students progress and develop readiness for practice.

Keywords: *metacognitive learning, ePortfolio, competency-based learning, reflection, intervention, formative assessment, comprehensive learner record, health professions education*

Introduction

A decade ago, a landmark Carnegie Foundation study found that nursing education has been designed with a sharp separation between traditional lecture-based instruction and clinical learning that undermines effective preparation for our health professions workforce (Benner et al., 2011; Frank et al., 2010). The study also revealed that nursing students frequently struggled to make sense of what they learned in lectures and were unable to transfer learning into the clinical practice arena. Inadequacies of this dichotomous approach to learning have many negative effects, including low pass rates on licensure exams, low graduation rates, a decrease in student confidence and ability to find jobs associated with their program preparation, and high attrition rates from the profession (Barbé et al., 2018; Benner et al., 2011). Additionally, leaders in health professions education have recognized that many graduates are not adequately prepared to provide safe, high-quality patient care and are

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calling for a radical transformation (Frank et al., 2010; Hickerson et al., 2016; Spector & Echternacht, 2010).

To address these issues, health professions organizations have promoted a shift from traditional lecture-based teaching to competency-based education models (American Association of Colleges of Nursing, 2019; Englander et al., 2013). A competency is a synthesis of knowledge and abilities that can be flexibly applied to solve complex problems in practice (Wolf, 2021). Developing competencies requires gaining a deep understanding of key concepts, engaging in practice in real or realistic clinical contexts, and integrating learning through reflection (Mann et al., 2009). Focusing on competencies ensures alignment between the classroom and clinical learning environments to support the development of complex skills required for safe and effective patient care.

Integrating learning while traversing a curriculum, from course to course and through clinical experiences, requires intentional design. In a traditional model, health professions students often regard courses as discrete units and are not able to comprehend how learning experiences relate to and build upon each other to support the development of competencies required for effective patient care. One solution to better integrate learning that has worked well outside of health professions education is the ePortfolio. A well-designed ePortfolio program has been embraced as a high-impact practice because it supports metacognitive development and helps students integrate learning across a curriculum (Kuh, 2008). ePortfolios have seen rapid adoption in undergraduate arts and sciences programs but have struggled to gain traction in health professions education programs because of a lack of congruence between health professions' pedagogy and ePortfolio practice (Andrews & Cole, 2015).

In this article, the authors propose that a comprehensive learner record (CLR), a dynamic real-time container of student work products linked to competencies, outcomes, and skills, may offer an effective solution, providing the benefits of metacognitive learning with the structured competency-based framework required to prepare students for reflective clinical practice and effective patient care.

The Importance of Metacognition in Health Professions Education

In the ever-changing landscape of health professions, clinicians must have the skills to monitor their critical thinking, comprehension, and problem-solving in order to continually adjust their behavior to novel situations (Medina et al., 2017). In this context, metacognition is essential to promote self-regulating professionals. Metacognition is defined as "a person's ability to regulate their thinking and learning and consists of the self-assessment skills: planning, monitoring, and evaluating" (Medina et al., 2017, p. 9). Effective metacognition requires knowledge about one's self as the learner, knowledge of the task, and knowledge of the strategies necessary to achieve a set goal, combined with regular monitoring and assessing of one's behavior. Healthcare professionals need metacognitive awareness of what they know and do not know in order to purposefully obtain new knowledge and continually assess for errors in thoughts or actions that could negatively impact patient care. Metacognitive

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control not only improves learning, but also it enhances professional performance and ongoing reflection and is a necessary precursor to effective clinical decision-making.

Social cognitive theory (SCT), developed by Albert Bandura (1989), emphasizes the dynamic interaction between the individual, their behavior, and their environment. Self-regulation occurs within the individual and impacts their behavior. Likewise, the environment affects the individual and their behavior in what Bandura called *reciprocal causation.* Self-regulation is a component of metacognition that requires goal-setting to motivate the individual to persist in a task. Research has shown that an individual's ability to self-regulate is predictive of performance and achievement outcomes (Robson et al., 2020). Supporting the metacognitive development of healthcare professionals is a powerful method to enhance lifelong learning, self-monitoring, and goal-directed behavior.

According to Ambrose et al. (2010), there are several steps involved in teaching metacognitive learning: "assessing the task at hand, evaluating one's own strengths and weaknesses, planning, monitoring performance along the way, and reflecting on one's overall success" (p. 216). This cycle encourages learners to make connections between the requisite skills of their intended profession and appraise their abilities linked to these skills based on their performance. This ongoing process enables students to practice metacognition not just once, at the end of their program, but regularly through reflective practice. In this way, students can make decisions about what they need to do next, what knowledge or skills they are missing, and seek other opportunities to gain the skills necessary to reach their goals (Carbonaro & Suchland, 2021).

Providing opportunities for learners to practice metacognition as part of their coursework and extending it into co-curricular experiences is beneficial in developing effective intellectual habits and flexible use of discipline-specific knowledge and skills (Ambrose et al., 2010). Through deep reflection, intentional self-directed learning can commence, giving students more autonomy to design and seek learning experiences that best meet their needs, fill in knowledge gaps, and provide opportunities for efficacious practices.

Autonomy to impact one's own learning builds personal development and confidence that transfers into the practice of treating patients and positively impacting their wellness. Educational institutions can implement organizational structures that support students' metacognition about their learning progress by providing formative feedback, determining strategies for fulfilling goals, designing pathways for filling in gaps, and opening up discussions with peers and advisors about the next steps in their learning journey (Carbonaro & Suchland, 2021). Comprehensive learner records can provide institutions of higher education and their students with a unified system to support metacognition and achieving professional competencies.

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Comprehensive Learner Records

A Comprehensive Learner Record (CLR) can be thought of as a cross between a traditional transcript and an ePortfolio. In fact, college and university registrars were early proponents of CLRs because they saw significant limitations of traditional transcripts to demonstrate meaningful learning to key stakeholders such as employers (American Association of Collegiate Registrars and Admissions Officers, n.d.). A CLR is designed to capture information on student learning at the assignment level, with each assignment specifically aligned to program learning outcomes and competencies. In addition to quantitative data collected from rubrics, a CLR collects artifacts of student learning from submitted assignments, similar to an ePortfolio.

In contrast to an ePortfolio, however, CLR provides a real-time digital collection of student work accumulated from courses, co-curricular, and extra-curricular activities, aligned to learning outcomes and providing feedback from faculty members. The CLR is designed to capture information directly from a learning management system and facilitate embedded assessment from within and across courses. Thus, a CLR provides information on the students' learning journey through a curriculum, from assignment to assignment, and course-to-course. Additionally, students are empowered to select artifacts from co- and extra-curricular activities related to program learning outcomes. Students can see evidence of their performance and make informed decisions about their learning. Faculty members and administrators are able to track individual student performance or aggregate assessment data. In this way, CLR serves as a transparent and formative assessment tool, providing evidence to enhance learning for individual students, as well as data empowering continuous improvement at the program level.

The History of Comprehensive Learner Records

CLRs first entered higher education in 2015 when the American Association of Collegiate Registrars and Admission Officers (AACRAO) and the National Association of Student Personnel Administrators (NASPA) initiated a discussion about the future of student records (Baker & Jankowski, 2020). The traditional transcript provided a record of a sequence of courses, credits, and grades students completed over their years of study. However, the transcript did not capture the achievement of learning outcomes or direct evidence of learning. Traditional transcripts also did not include co-curricular or extracurricular activities, leadership in clubs and organizations, or specific details of internships and jobs. NASPA and AACRAO collaborated together on a Lumina grant to reimagine the transcript and initiated two pilot studies to develop and evaluate a CLR. The information gleaned from these studies provided further insight into CLR and even a blueprint for using it effectively to support student growth.

Results from these early pilot studies suggest that through intentional curriculum mapping of outcomes, competencies, and skills to learning experiences, performance data on student progress can not only provide data for continuous improvement reporting but also support individual student learning. A student's CLR updates in real-time, absorbing performance data and original work produced by students from experiential activities linked to the curriculum map. In this way, a CLR automates the flow of data into an authenticated record of achievement with metadata of when and how a student completed and earned achievements, digitally confirmed by the institutions issuing the document (Baker & Jankowski, 2020).

A CLR can help students synthesize learning from courses, co-curricular activities, student employment, and even their self-initiated experiences. Bringing evidence of learning from these experiences together in one platform enables students to discern areas of strength and growth, and opportunities for improvement. Similar

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to how the military reflects through immediate "after-action review," the CLR process enables learners to engage in the metacognitive cycle: reflect on lessons and performance from one event or activity, make adjustments, and apply new knowledge, skills, and abilities to another learning activity or course (Darling et al., 2005). A CLR serves as the access point for performance data enabling self-reflection for students to make sense of their learning and determining areas of strengths and areas for growth (Braxton et al., 2021). By providing tangible data to focus reflection, a CLR empowers learners to develop self-efficacy in developing competencies and provides feedback on what they need to do to improve.

In early 2021, after a five-year effort informed by the Lumina Grant, the first iteration of a CLR standard was published. Thus, the CLR model became a documented portfolio of evidence of student learning and development in a digital form, with a single standard enabling portability between institutions and providing a pathway to verified achievements for students to share with employers. The standard enables learners to easily share their CLR, or portions of their CLR, including artifacts specific to career or job descriptions with applicant platforms, social media providers, or an assignment for a course or experience.

In health professions education, the design of a CLR infrastructure offers the potential to align competency-based learning outcomes with learning activities and assessments in classes, labs, simulations, co-curricular experiences, and clinical practice. This infrastructure would enable the CLR to capture assessment data across a curriculum, tracking students' achievement from course to course. Learners would benefit because their CLR communicates the coherence of the curriculum as they move toward competency, and they can share evidence of their achievements with potential employers. A CLR can provide data to guide instructors, advisors, and academic support teams to facilitate student learning better. By setting benchmarks and levels of learning in the curriculum in an assessment platform, automatic triggers for intervention and reassessment can happen in real-time, serving as a formative assessment mechanism for learners, giving them time during the semester to hone their skills, engage in repetitive practice, and reassess to meet competencies without failing to progress.

Comprehensive Learner Record as ePortfolio 2.0

ePortfolios were originally intended to provide structured digital spaces for students to curate work from courses across the curriculum to demonstrate their learning. However, an ePortfolio is much more than just a collection of learning artifacts. When designed well, ePortfolio provides a structure for students to reflect on what they are learning and make sense of their learning trajectory as they move from course to course across a curriculum (Eynon & Gambino, 2017). Through structured metacognitive reflection embedded in an ePortfolio process, students can continually work to integrate and deepen what they are learning. Thus, a well-designed ePortfolio has been recognized as a high-impact practice because it provides structured opportunities for students to reflect on their learning across different experiences and develop opportunities for further study throughout their lifelong learning journey (Kuh et al., 2017). Through the iterative process of collecting artifacts, reviewing, revising, and reflecting within an ePortfolio, learners are able to create knowledge while actively developing their professional identities. A well-designed ePortfolio invites, fosters, and supports reflection as a student progresses through a curriculum (Yancey, 2009).

While a CLR is similar to an ePortofolio, it has significant differences that may increase utility in health professions education programs. First, an ePortfolio requires students to select, collect, and archive academic coursework to represent their learning, which can be a time-consuming process. A CLR collects this information automatically through faculty-selected key assignments designed to assess program learning outcomes. Since

the collection and curation process is automated and embedded within course assessments, students receive real-time feedback on their progress towards achieving program learning outcomes. This formative feedback can include scores from a rubric aligned to learning outcomes and specific written comments from faculty about how to improve.

Most importantly, a CLR can provide students with opportunities to make sense of their learning in real-time as they progress from assignment to assignment and course to course. A CLR also enables students to self-select co-curricular activities based on their areas of interest and need for growth. These activities are also aligned with program learning outcomes and provide further evidence of achievement of program learning outcomes.

Table 1

Comparison of Traditional ePortfolios and CLR

Traditional ePortfolio	Comprehensive Learner Record (CLR)
A student-generated compilation of artifacts from academic coursework added to a web-based platform.	An automatic compilation of student work aligned to program learning outcomes and embedded in the curriculum.
Often manual process of selecting and collecting artifacts to include.	An automated process in which artifacts are collected from the learning management system, aligned to rubrics, and linked to faculty grading and feedback.
A summary of student work usually produced by the student at the end of a course or program.	A comprehensive collection of student learning collected in real-time.
Evidence from assignments previously graded by instructors uploaded to a platform as summative assessment or program exit criteria.	Evidence from assignments with instructor feedback, providing formative assessment data to support student learning.
Often does not include co-curricular and extracurricular activities.	Designed specifically to include co-curricular and extracurricular activities, with the ability to link these experiences to program learning outcomes.
Often used to satisfy a requirement for accreditation, used in parallel with a summative reflection.	Built on the foundation of a learning framework, the CLR autogenerates evidence for students to reflect on learning in real-time
Provides opportunities for students to make sense of their learning retrospectively.	Provides opportunities for students to make sense of their learning in real-time.

Like an ePortfolio, a CLR can scaffold the metacognitive thinking and provide students opportunities to integrate learning across the curriculum (Eynon et al., 2014). However, instead of this being a

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retrospective activity, above and beyond the designed curriculum, the processes of collecting evidence of learning and receiving formative feedback is embedded in the curriculum. Thus, a CLR provides all of the benefits of an ePortfolio and builds on these benefits to provide an institution-wide platform nested within curricula to directly support and measure the development of competencies, goal-setting, and structured reflection to foster metacognition and improve self-regulation. Thus, CLRs can be viewed as the next iteration of ePortfolios, or "ePortfolio 2.0".

Through mapping and alignment, learners do not have to burden themselves with searching for evidence of their learning linked to skills in past courses, or in their computer hard drives; instead, they can go to their CLR dashboard and see in real time how they are performing on the essential skills and competencies identified to succeed in their future profession. In addition, they can use the assignments and evidence linked through a program or institution's mapping process and add these artifacts to individual ePortfolios within their CLR for various purposes: presentation and capstone assignments, peer-to-peer feedback, reflection, goal-setting, and specific jobs or internships. After conducting a full audit of their work, noting their areas of strength and growth, students can choose to enroll in other experiences that link to the skills they need to practice, enabling them to self-direct their learning, thereby engaging in the metacognitive skills necessary for reflective practice. CLR serves as a conduit to assessing students' personal development in relation to skills, goals, and future aspirations.

Designing a Comprehensive Learner Record Initiative

At the University of Rochester School of Nursing (URSON), faculty members are in the midst of shifting their curriculum from traditional lecture-based learning to experiential learning that emphasizes core professional competencies. They have partnered with HelioCampus through the AEFIS platform—a unified system for managing institutional assessment—as their certified CLR provider.

Based on recommendations from NILOA, the faculty have engaged in a four-step process starting with the identification of learning outcomes as the basis for a learning framework, ensuring alignment between learning outcomes, learning activities, and assessment (Baker & Jankowski, 2020). The learning framework was organized around professional standards and competency-focused program learning outcomes. These outcomes are aligned to courses, course learning outcomes, and signature assignments that explicitly measure developmental achievement through rubrics.

The second step was to use the learning framework to create a digital curriculum map within the assessment management platform. This involved adding the program learning outcomes and linking these with courses and course learning outcomes in the assessment management system. This digitized curriculum map became the scaffolding upon which the CLR can be built.

With a learning framework developed and the curriculum digitized, the next step is to develop a program-level assessment plan. This includes identifying where progress towards learning outcomes will be assessed course-by-course, and how that progress will be measured in assignments, tests, and other assessments. The plan is to develop one or two key "signature assessments" aligned to program learning outcomes in each course that can be used to assess this progress. Assessing progress towards learning outcomes requires the use of

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developmental rubrics leveled with appropriate milestones. URSON developmental rubrics are similar to the American Association of Colleges and Universities' Valid Assessment of Learning in Undergraduate Education (AAC&U VALUE) Rubrics (McConnell et al., 2019), but they are targeted toward the identified program learning outcomes, which align with professional competencies.

Using a set of pilot courses in population health and a capstone course in spring 2022, faculty began building the curriculum infrastructure to support their CLR outcomes. From there, CLR leaders at HelioCampus and URSON course instructors conducted a series of meetings and presentations to discuss plans for rolling out CLR to students. This process of digitizing curricula will lead to an end-to-end CLR—which URSON can use to better prepare students as healthcare professionals and provide them with an appropriate way to reflect upon their achievements and to share their learning experiences with employers.

The cornerstone of the URSON CLR plan is to intentionally add metacognitive elements through planned and focused reflection prompts at different milestones across the curriculum. This will occur during the capstone course, where students can review artifacts in the CLR that provide evidence of what they have learned across the program and integrate this learning through structured reflection. Faculty also plan to add this type of curation and reflection at specific milestones as students progress through the program. The CLR will allow students to use data on their own achievements and collected artifacts to reflect and make sense of their learning across the curriculum. Thus, the CLR will serve as a powerful tool to promote metacognitive learning and enhance the integration of knowledge required to develop competencies and self-regulation for effective clinical practice.

Table 2

URSON CLR Design

Design Step	Activity
Identify learning outcomes or frameworks.	Create alignment between learning outcomes, learning activities, and assessment. This provides intentionality and categorization of information on the CLR.
Create a digital curriculum map for tracking.	Add program learning outcomes and link these with courses and course learning outcomes in an assessment management system. A CLR-certified platform is preferred for portability and verifiability.
Design a program-level assessment plan.	Identify where outcomes are assessed and how that progress will be measured in assignments, tests, and other assessments.

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	Develop one or two key "signature assessments" aligned to program learning outcomes in each course.
Design and approve program-level rubrics.	Faculty engagement in designing and vetting rubrics for key signature assessments. This provides the learner with their specific progress toward meeting outcomes and competencies associated with their assessments and student work.

Evaluation of Progress of the URSON CLR

Health professions programs across the country are at different points in their development of a bank of rubrics used to score students on key signature assessments linked to outcomes and competencies. It is vital that faculty are engaged and involved in the development of these rubrics used to assess student learning in their courses and other clinical activities. These rubrics frame the feedback loop, formative assessment, and CLR initiative at the program, college, and institutional level.

At the URSON, progress on the CLR has been slower than expected for two major reasons. First, as noted by Baker and Jankowski (2020), the process of working with faculty to develop measurable program learning outcomes and mapping to them requires significant time and effort, but is essential for providing the learning framework required to scaffold the CLR. This process took nursing faculty 12 months. Second, URSON stakeholders have found the process of designing developmental rubrics aligned to professional competencies to be equally challenging. The team naively thought this process would be quick. However, in hindsight, it is clear that the process of rubric development requires the same of deliberation and dialogue as the process of developing the AAC&U VALUE Rubrics (Rhodes, 2010). Although this timeframe may be reduced because the VALUE Rubrics provide a roadmap and proof-of-concept, the process of rubric development will require an additional 12-months. Thus, while URSON has developed the infrastructure for the CLR in its RN-BS program, they are still in the process of pilot testing and expect to have more data on outcomes and the student experience after the 2022 fall semester.

Conclusion and Implications for Practice and Further Study

A well-designed curriculum focused on teaching competencies needed for practice in today's complex healthcare systems will require an institution-wide assessment system capable of measuring and tracking student achievement. A CLR platform can meet this critical need by collecting evidence of learning as students complete assignments, tests, clinical evaluations, community involvement, and other assessments from course to course, across a curriculum. More importantly, a CLR can empower students to practice deep reflection and metacognition to enhance self-regulated learning. In the authors' experience, building a CLR requires a significant investment in time to develop a learning framework with aligned learning outcomes, learning activities, and assessments. Yet, once that learning framework is built in the CLR platform, data can be collected automatically as students submit work and faculty grade assignments and other key assessments. And the

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efforts in designing this CLR initiative is no different than what is expected for universities and colleges to demonstrate their institutional effectiveness and compliance certification for institutional and programmatic accreditation. In addition, employers are seeking to identify candidates with the right knowledge, skills, and abilities to perform complex jobs in health care and beyond. CLR can help candidates articulate their learning to employers, and employers can review verified evidence of achievement of prospects to fill much needed roles at their organizations. This cycle of value and return on investment is a key indicator of institutional effectiveness and curriculum performance.

As nursing schools and other health professions programs transition toward competency-based learning, a CLR will provide an essential mechanism to communicate the achievement of core competencies as students progress through the curriculum and demonstrate their preparedness for practice.

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