

Curriculum Dashboard Resource

Gary L. Beck Dallaghan, Ph.D.; Director of Educational Scholarship, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, North Carolina

April Buchanan, M.D.; Assistant Dean for Academic Affairs, University of South Carolina School of Medicine Greenville, Greenville, South Carolina

Eve Colson, M.D., MHPE; Associate Dean for Program Evaluation and Continuous Quality Improvement, Washington University School of Medicine, St. Louis, Missouri

Lisa Coplit, M.D.; Associate Dean for Faculty Development, Frank H. Netter School of Medicine at Quinnipiac University, North Haven, Connecticut

Lars Osterberg, M.D., MPH; Associate Professor of Medicine, Stanford University School of Medicine, Stanford, California

Brenda Roman, M.D.; Associate Dean for Medical Education, Wright State University Boonshoft School of Medicine, Dayton, Ohio

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Introduction

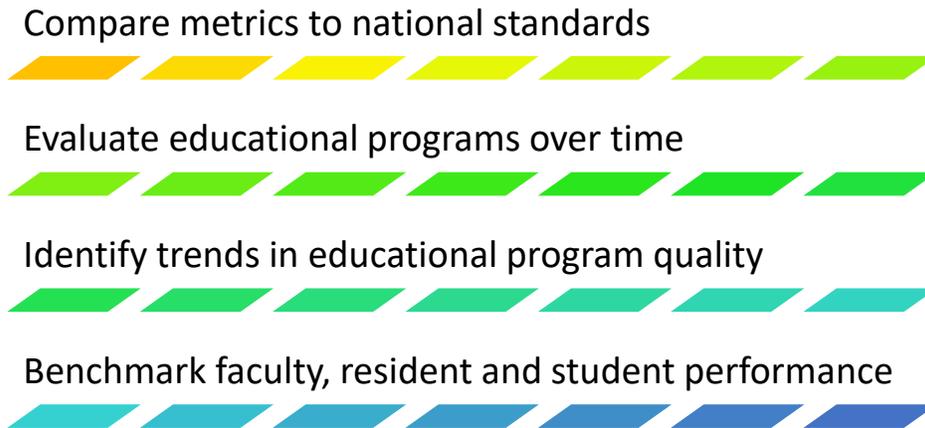
Medical schools obtain large amounts of data about their students, faculty, courses, clerkships, etc. in an effort to meet institutional goals and objectives and comply with standards for accreditation. However, this data is often collected by different groups and housed in various locations, making retrieval, review, and planning challenging. Liaison Committee on Medical Education (LCME) Element 1.1 requires a medical school to engage “in ongoing planning and continuous quality improvement processes that establish short and long-term programmatic goals, result in the achievement of measurable outcomes that are used to improve programmatic quality, and ensure effective monitoring of the medical education program’s compliance with accreditation standards” [LCME, 2018]. In order to achieve continuous quality improvement, administrators and key decision-makers at institutions need to have a comprehensive and detailed understanding of the information collected and a methodology for tracking this information. A curriculum dashboard provides such a resource, allowing leaders and educators to make informed decisions using evidence and data analytics in order to optimize the learning environment.

In an effort to ensure LCME compliance and achievement of mission-based goals, several medical schools have developed comprehensive data warehouses and curricular dashboards which provide a framework of reference. For example, the Education Data Warehouse at New York University (NYU) has developed and piloted undergraduate medical education continuous quality improvement processes that have facilitated “evidence-based, data-driven decision-making regarding the content and delivery of educational materials” and created “fresh focus to key success factors in the clinical classroom of clerkships, quantifying the educational impact of both teaching faculty and house staff” [NYU School of Medicine, 2015]. NYU relies heavily on information technology in the review of education big data to drive teaching, learning, and innovation.

Another example is the leadership team for undergraduate medical education at Stony Brook University School of Medicine who focused on an upcoming LCME visit and “developed and implemented summary dashboard performance reports in 2009 to document LCME standards/criteria compliance, evaluate medical student performance, and identify progress in attaining institutional curricular goals and objectives” [Shroyer et al., 2016]. They identified key performance indicators (KPIs) and metrics of success, color coded compliance level reports, and created a systematic approach for review of dashboards by key stakeholders who then created and implemented action plans for change.

There are many examples across the country as dashboards are being used to meet common accreditation needs and individual institution's goals/missions. Figure 1 offers some reasons for institutions to consider a curriculum dashboard.

Figure 1. Reasons to Develop Curriculum Dashboards



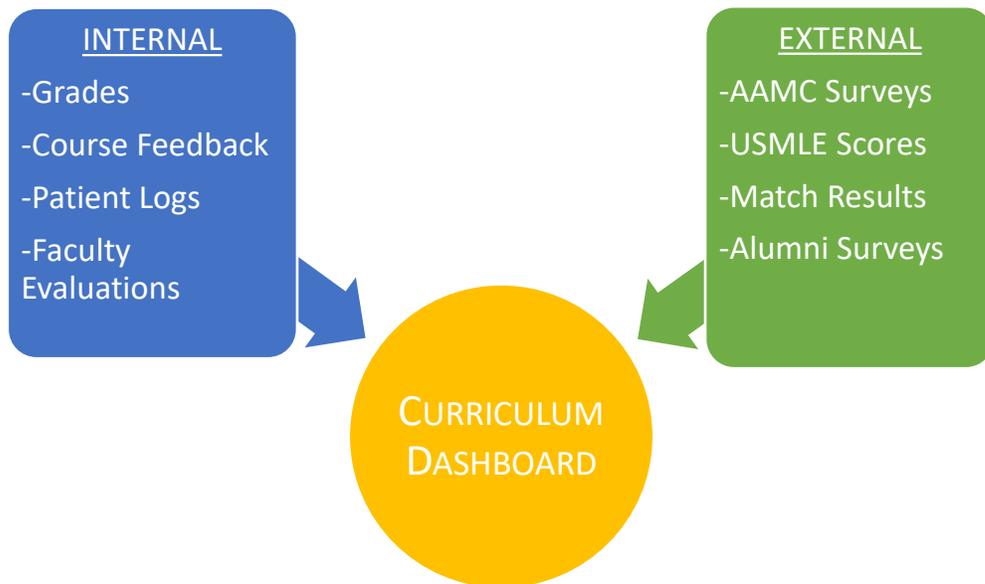
Last, to ensure success, stakeholders need to be engaged early in the process to develop a comprehensive approach that will meet the expectations and needs of various groups. As medical schools consider the development of a curriculum dashboard, administrators and faculty need to consider which data to include (including both internal and external sources), a plan for data management, data presentation, and sharing of information. This article will address each of these areas in order to provide institutions a framework for developing dashboards that are well-planned, appropriately monitored, and valuable in meeting institutional goals and achieving continuous quality improvement.

Data to Include

Curriculum dashboards are only as useful as the information included within them. Each school will decide what to include on the dashboards based on quality improvement plans, who will be viewing the dashboards, and the areas of the curriculum most salient to the school. In addition, privacy issues should be considered when deciding what information should be placed on dashboards and who will receive that information. Dashboards for a clinical department chair, for example, might provide high level information such as how their core clerkship metrics compare to other core clerkship metrics. Course or Clerkship directors, on the other hand, may want more granular information that will help them determine specific strengths and opportunities for improvement of their course or clerkship.

There are two main sources of data for populating dashboards, internal and external (Figure 2). Internal sources include information collected at the school, such as admissions statistics, student performance, student encounter and skill logs, teacher performance, and student feedback about courses and clinical experiences. Internal data allows benchmarking within the school, for example, across courses and clerkships and years.

Figure 2. Examples of Internal and External Data Sources for Dashboards



Schools will also likely have access to external data, such as that provided by accreditation bodies. For example, the Association of American Medical Colleges

(AAMC) provides the graduation questionnaire each year to medical schools which allows schools to compare student responses over years using national benchmarks. This information can be used by education leaders to make informed changes to their curricula and therefore, the dashboard can be an important tool for continuous quality improvement [[Shroyer et al., 2016](#)]. Other pieces of external data might include other AAMC survey data, USMLE performance, Match results, alumni surveys, etc.

Whether from internal or external sources, schools should consider using both quantitative and qualitative data from a variety of sources, when available, for a more robust view of their curricula [[Hansen et al., 2013](#); [Boscardin et al., 2018](#)]. Quantitative data can help educators know frequencies and means on scales while qualitative data, often narrative, can explain the “why” behind the numbers. Knowing both how much and why can guide the focus of change for curriculum improvements.

Data Management Plan

Curriculum Dashboard Data Collection

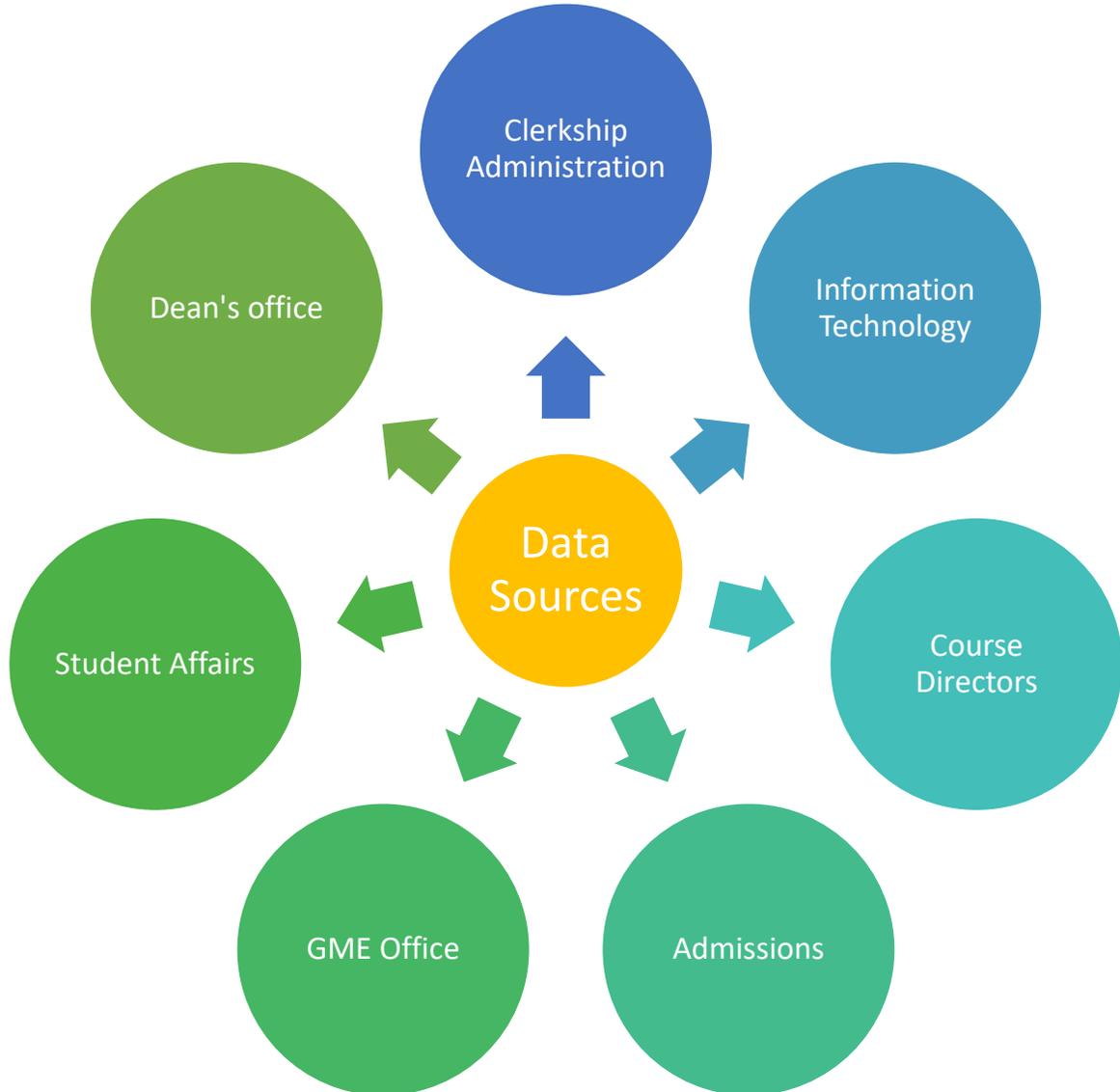
Unless your medical school has a data warehouse where all curriculum and medical student records are housed, collected data will most likely be stored in various places, making it difficult to access information quickly and to ensure that all necessary data is included. It is important to identify the key constituents on campus, such as the admissions office, course directors, etc., and have a discussion about what key pieces of information need to be included. For example, as part of the dashboard you want to see individual course performance longitudinally, then each piece of data will need to include a common identifier. For example, courses typically have an identification number assigned by the registrar's office. When a student is enrolled in that course, the student's identification number is associated with that course identification number. These types of identifiers should remain consistent in the dashboard database to link varying data points.

There are other data sources that are used to evaluate the curriculum, such as the AAMC student questionnaires. These results are aggregated along with national numbers. It is crucial that this data be matched to the appropriate class, along with other internal evaluations from that class, as students' retrospectively giving their perspectives on the graduate questionnaire may be very different than the "real time" evaluation data obtained at the time of course completion. For example, the graduate questionnaire data about specific clerkship experiences may not be congruent with evaluations obtained at the completion of the clerkship. Since students are completing the graduate questionnaire a year or more after completion of the course, the responses need to be matched to the appropriate internal evaluation gathered in real time versus the retrospective evaluation completed a year later.

With that being said, consider what was discussed in the previous section about the different pieces of data you want to collect. What you will need to ask yourself is "who holds the data?" What pieces of information does the admissions office have and what data does the office of medical education maintain? Is there information from facilities or the Dean's business office that you want to include? Do individual courses or clerkships maintain records that could be accessed? Where data resides on alumni and how can you include that?

Figure 3 offers some suggestions of key contacts for data. We recognize this list is not exhaustive and each school has different labels for some of these responsibilities.

Figure 3. Key Contacts for Sources of Data



Verifying Data for Curriculum Dashboards

As with any database, the quality of your output depends on the accuracy of the inputs. Student identification numbers can be used to link data sources, and a query will help determine if the records are aligned properly. Proper mapping of course and clerkship objectives to program level objectives will ensure queries pull intended information. Mapping of examination items and session level objectives to module and clerkship objectives is also important to obtain a comprehensive curricular map.

Course and clerkship directors are critical players in this mapping process to ensure complete and accurate data is entered into whatever curriculum database is used.

Ultimately, the curriculum dean is responsible for the veracity of the data. Having the curriculum committee or a subgroup review raw data to determine if information is complete and linked appropriately is essential. Once data has been verified, then reporting can begin.

Examples of Data Analytics Programs

The business world has led the way in developing data analytics programs. Several software packages exist that have the potential to be modified for use in academic settings. One such program is Tableau, which has been used at the Mayo School of Medicine. One45 is a commonly used software package at many medical schools, used as a learning management and evaluation system. They are in the process of piloting a data warehouse feature that is designed specifically for academic settings. For schools who do not have the technological expertise to build their own data warehouse, these may be viable alternatives.

The following list of companies were mentioned or identified at the 2018 AAMC Learn Serve Lead meeting, but are by no means comprehensive. We are in no way endorsing these products and have no financial interests with them. They are provided as examples, but we recognize there are numerous other companies developing similar products.

- eMedley <https://he.emedley.com/univ/he/common/login/login.php>
- One45 <https://www.one45.com/>
- PowerBi <https://powerbi.microsoft.com/en-us/>
- Tableau <https://www.tableau.com/>

Data Presentation

Reporting Curriculum Data

It is extremely important to consider what output you want before you even develop the data warehouse. Knowing what types of reports you want will guide what types of data are collected. For this reason, considering the various stakeholders who will be interested in this information is an important first step in developing the dashboard.

When reporting the information, clarity is the key. Many of us have seen graphs that are cluttered and unclear, and therefore difficult for users to accurately access and interpret the data. The following example from one university clearly displays comparison data of their students to that of the national results from USMLE (Figure 4).

Figure 4. Comparison of Mean University Scores to National Results

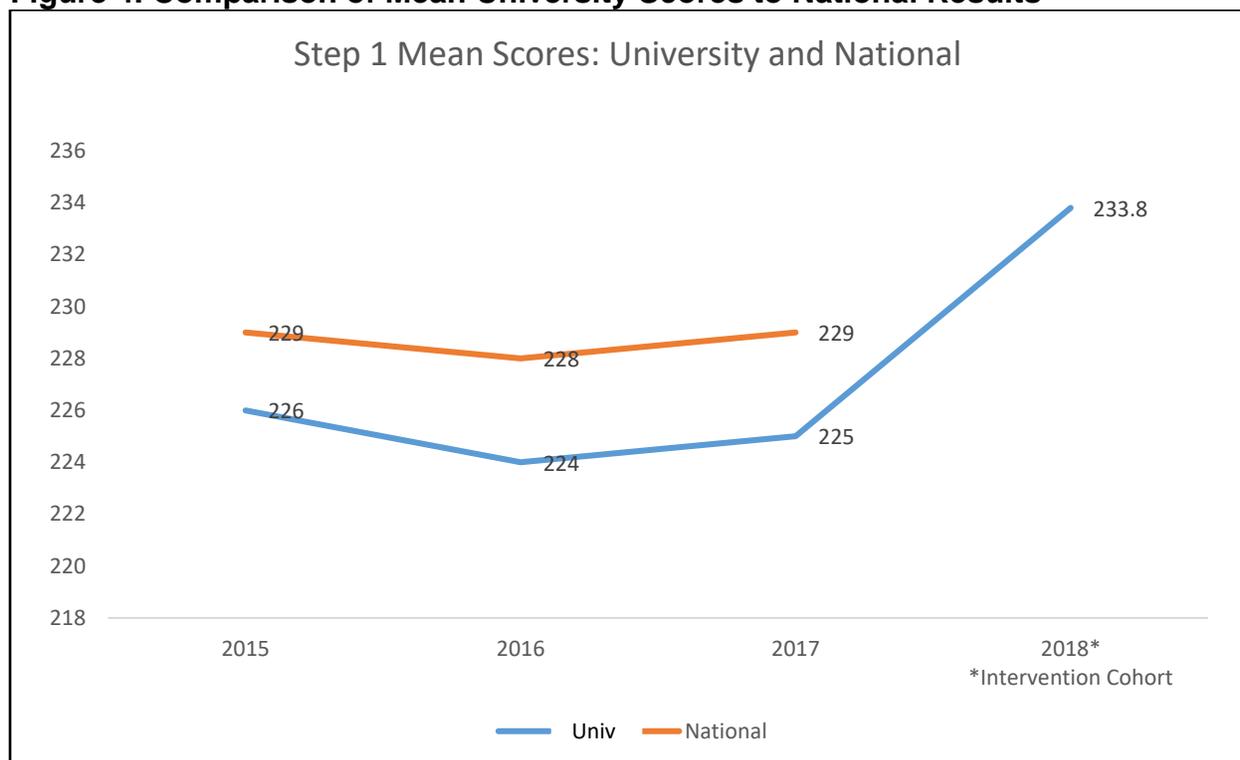


Figure 4 used with permission by the school of medicine as long as it remains anonymous.

You will need to consider what information may best be represented in a table or as a figure/graphic. Sometimes it is helpful to have both, particularly if the table includes many columns of numbers.

Tables

Tables present lists of numbers or text in columns and can be used to summarize existing data. Tables are typically used to present raw data, not when you want to show a relationship between variables.

Tables are easy to construct in word processing or spreadsheet programs. Column headings should clearly identify what is contained in the content of the items under that column. Tables can summarize both quantitative and qualitative data points. An example of a table that could summarize findings would be identification of where learning objectives are mapped to program objectives.

Table 1 provides an example of patient care objectives and where in the curriculum they are fulfilled.

Table 1. Example of Curriculum Map by Clerkship

Patient Care and Clinical Skills: Students must be able to provide care that is compassionate, appropriate, and effective for treating health problems and promoting health.							
	Fam Med	Int Med	Neuro	OB	Peds	Psych	Surg
PC1. Obtain an accurate, age-appropriate medical history	X	X	X	X	X	X	
PC2. Demonstrate proper technique in performing both a complete and a symptom-focused examination, addressing issues of patient modesty and comfort	X		X	X	X	X	
PC3. Perform routine technical procedures and tests under supervision and with minimal discomfort to the patient		X					X

As you can see from this example, the overarching patient care objective is further clarified with the subsequent objectives in the left-hand column. The “X” indicates that the clerkships in the column headings have specific objectives that are mapped to the

different objectives listed on the left. This is just one example of a table that could be developed as a means of summarizing data in a dashboard.

Figures/Graphics

Figures are visual presentations of data. Figures provide visual impact to communicate primary findings. They can be used to display trends and patterns of relationships, but they can also be used to communicate processes or display complicated data simply. Figures typically do not duplicate the same information found in tables but may be done in order to clearly display trends not obvious in tables.

There are many different ways in which data can be graphically displayed. Pie charts, bar graphs, scatter plots, and line graphs are some of the more common methods of summarizing data. Some precautions to take when creating graphics include striving for simplicity, clarity, and accuracy. If you have multiple points to make, consider using less data in multiple graphics, that way the data is clear and accurate. The following are examples of a data displayed in different ways. The first presents a longitudinal summary of teaching methods across three semesters for a course (Figure 5). The second is a pie chart presenting the same data for a single semester but in a different fashion (Figure 6). It is up to you to decide the best way to present the information. The key is to ensure clarity of the summarized data.

Figure 5. Longitudinal Summary of Teaching Methods Across Three Semesters

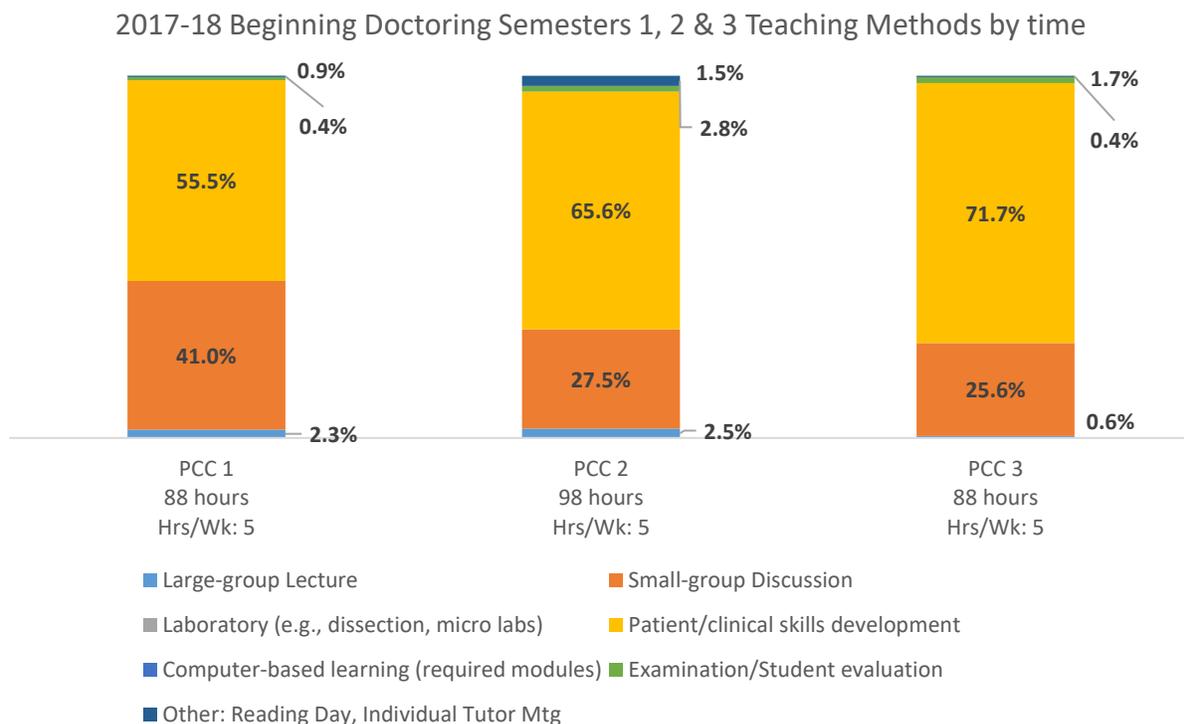
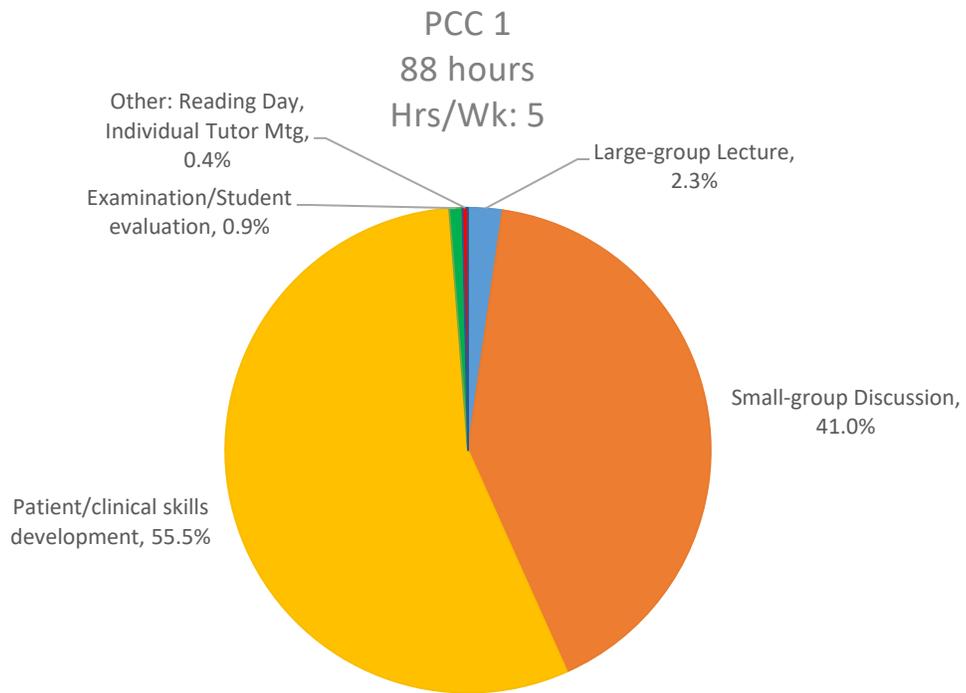


Figure 6. Summary of Teaching Methods for One Semester



Sharing Reports

Curriculum/Education dashboards can produce vast amounts data and reports on student performance and curricular outcomes. These reports provide valuable information for continuous quality improvement for many different stakeholders in the institution. Reports can also be customized for different stakeholders. Listed below are possible stakeholders with whom you may want to share dashboard reports and potential uses of the reports [[Simpson et al., 2012](#); [Ferguson, 2017](#); [Hammoud et al., 2018](#)]. There are certainly more stakeholders that could be included and more uses not listed in Table 2. Stakeholders vary by institution and uses are dependent upon intended goals and technology limitations.

Table 2. Internal & External Stakeholders for Curriculum Dashboard Reports

Internal stakeholders	Potential Uses
Curriculum Deans	<ul style="list-style-type: none"> • Create performance benchmark “triggers” • Identify areas needing monitoring or improvement • Identify gaps and redundancies and assist with integration initiatives • Review of course/clerkship performance indicators • Review of large blocks of curriculum • Monitor faculty and resident teaching performance • Monitor effects of innovations • Utilize data for education research • Utilize data for strategic planning • Determine areas needing funding
Curriculum Committee	
Course and Clerkship Directors	
Year Directors	
Student Affairs Office	<ul style="list-style-type: none"> • Monitor student feedback on course, clerkships, site • Monitor GQ data and other metrics of student experience • Create trainings/interventions based upon findings
Residency Program Directors	<ul style="list-style-type: none"> • Monitor quality of resident teaching
Department Chairs	<ul style="list-style-type: none"> • Compare specialty specific clerkship outcomes to all clerkships • Compare clinical sites - learning environment, teaching, duty hours, etc
Admissions	<ul style="list-style-type: none"> • Provide major performance outcomes to applicants • Research predictors of success • Inform admissions processes/goals
Diversity Office	<ul style="list-style-type: none"> • Monitor diversity goals
LCME leads	<ul style="list-style-type: none"> • Utilize reports for self study processes • Use tables/data for completion of DCI
CQI leads	<ul style="list-style-type: none"> • Identify areas needing monitoring and improvement • Use tables/data for reports

Faculty Development Office	<ul style="list-style-type: none"> • Monitor faculty and resident teaching performance by site • Create trainings/interventions based upon findings
Faculty	<ul style="list-style-type: none"> • Compare individual teaching performance to institution norms • Monitor effects of innovations • Utilize data for education research
Assessment Office	<ul style="list-style-type: none"> • Revise assessments and reports as needed based upon results
Student Coaches/Advisors	<ul style="list-style-type: none"> • Compare individual student performance to class/group performance
Medical Students	<ul style="list-style-type: none"> • Compare individual performance to class/group performance for self-assessment
External stakeholders	Potential Uses
University Leadership	<ul style="list-style-type: none"> • Monitor medical school performance indicators • Identify areas needing monitoring or improvement • Use tables/data for accreditation reports
Board of Directors	<ul style="list-style-type: none"> • Review medical school performance indicators • Determine areas needing funding
Donors	<ul style="list-style-type: none"> • Highlight areas of quality/strength • Determine areas needing funding
LCME	<ul style="list-style-type: none"> • Monitor medical school performance indicators • Identify areas needing monitoring or improvement
Affiliate Hospital Leadership	<ul style="list-style-type: none"> • Monitor specialty specific clerkship outcomes • Monitor sites specific goals/outcomes • Monitor student feedback of site experience • Monitor faculty and resident teaching • Identify areas needing monitoring or improvement

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