

Curriculum development: a how to primer

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ABSTRACT

Curriculum development is a topic everyone in the field of medical education will encounter. Due to the breadth of ages and types of care provided in Family Medicine, family medicine faculty in particular need to be facile in developing effective curricula for medical students, residents, fellows and for faculty development. In the area of medical education, changing and evolving learning environments, as well as changing requirements necessitate new and innovative curricula to address these evolving needs. The process of developing a medical education curriculum can seem daunting but when broken down into smaller components can become very straightforward and easy to accomplish. This paper focuses on the curriculum development process using a six-step approach: performing a needs assessment, determining content, writing goals and objectives, selecting the educational strategies, implementing the curriculum and, finally, evaluating the curriculum. This process may serve as a template for Family Medicine educators, and all medical educators looking to design (or redesign) their own medical education curriculum.

INTRODUCTION

Developing curricula is an important topic at all levels of medical education, from teaching medical students and residents to developing ongoing professional education. Despite its importance, it is easy to slip into a pattern of ad hoc curriculum development with little attention to desired outcomes. To maximise the potential of any medical education initiatives, we present a systematic approach to developing and evaluating curricula. Therefore, the purpose of this article is to describe the curriculum development process over six steps: performing a needs assessment, determining content, writing goals and objectives, selecting the educational strategies, implementing the curriculum and finally, evaluating the curriculum.

BACKGROUND

The word curriculum originated in classical Latin where the original meaning was 'running' or 'race course'. Over time, it transitioned to meaning 'a course of study' or more specifically, 'a course offered by an educational

institution'.¹ Curriculum in medical education can vary widely in size and scope, encompassing individual topics such as learning to take vital signs in the first year of medical school, to very large areas with longitudinal scope such as a curriculum on decreasing errors in hospitalised patients through improved transitions of care. For the purposes of this paper, we will refer to any planned educational experience as an example of a curriculum.

The exact nature of a curriculum should be seen as the 'what' of the educational experience, such as the description of the intended learning outcomes or the document used to describe these. The development of this description or document in a systematic and concrete way is the focus of this paper, which should in turn drive implementation.

There are several underlying assumptions in approaching curriculum development that are well articulated by David Kern.²

First, educational programs have aims or goals, whether or not they are clearly articulated. Second, medical educators have a professional and ethical obligation to meet the needs of their learners, patients and society. Third, medical educators should be held accountable for the outcomes of their interventions. And fourth, a logical, systematic approach to curriculum development will help achieve these ends. (page 5).

The development of educational curriculum is by nature driven by the discipline itself. There have been profound changes to the field of medical education over the last several decades with a shift from simply delivering knowledge to the learner to teaching skills such as clinical reasoning among others. As the process has shifted so has the need for developing appropriate curricula to teach these new skills become more important. Within family medicine, in particular, there has also been a shift to thinking about preventative and population health which along with huge changes in practice environments have driven need for more diverse educational strategies.



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Medical education curriculum development has largely drawn from general education curriculum development with refinement over time into a framework that is largely accepted and taught throughout the field of medical education.² We will use this framework, combined with our own experiences and published examples of curriculum development, to lay out a format that can be widely applied to whatever educational topic is attempting to be taught.

The framework outlined in this paper is a combination of previously articulated curriculum development approaches by Patricia Thomas and David Kern,² as well as the framework used in the University of Michigan Faculty Development Institute's Workshop on Curriculum Development.

The six steps are:

1. Performing a needs assessment and writing a rationale statement.
2. Determining and prioritising content.
3. Writing goals and objectives.
4. Selecting teaching/educational strategies.
5. Implementation of the curriculum.
6. Evaluation and application of lessons learnt.

The prompts for the development of a curriculum can be multifactorial. They can be external, coming from outside the group, such as the requirements of accrediting bodies or less well-defined 'movements' in delivery of care models. Internal motivations may arise as well, for example, from review of learner's performance evaluations or needs specific to the community being served by the learners.

The following is an example from the experience of one of the authors (JS) of this paper that was initially prompted by learner's performance. During the review of residents' performance at a small residency programme, it was noted that there was a slow rate of acquisition of communication skill milestones by a substantial number of learners, making it clear that the issue was less about the individual learners and more systemic in nature. On further reflection, it became clear there was not a specific educational strategy to teach this topic. This led to the formation of a working group to develop a curriculum to teaching communication skills. The group met several times and followed a specific curriculum development process. The process began by discussing if there was broad agreement that this curriculum needed to be developed and on what data that decision was being based on (step 1: performing a needs assessment and writing a rationale statement).

The next step was to determine what exactly was going to be addressed, and a process was undertaken to review both the milestones for communication skills given by the outside accrediting body for our programme and a review of the state of education around teaching communication skills in family medicine residency education (step 2: determining and prioritising content). Once we determined the content we wanted to cover, we expanded to what that would look like to the learner at the end of the curriculum, and then developed a set of goals and

objectives for our curriculum (step 3: writing goals and objectives).

Next, we involved an educational specialist from our larger Graduate Medical Education Committee to help us in the selection of educational strategies. As we were a small programme, we did not have a specialist in communication skills; therefore, we were strategic in matching our strategies to the skills of our faculty teachers. From there, we organised the strategies into a formal curriculum with details of what would be taught, by whom and when (step 4: selecting teaching/educational strategies).

The next year, the curriculum was rolled out to the family medicine residents in the form of lectures and workshops, precepting strategies and feedback tools (step 5: implementation of the curriculum). Throughout the course of that year and into the next, we evaluated the individual components and also the milestones pertinent to our curriculum, and then returned to the overall plan and adjusted for improvement (step 6: evaluation and application of lessons learnt). Overall, the process was a success, the new curriculum was in place and over the next several years slow improvement in the attainment of milestones relevant to this curriculum was seen.

In the above example, the steps outlined were followed in a stepwise fashion, but that is not necessary to the success of a curriculum. In the case that a curriculum is already in place, evaluation may lead to revision, which in turn may lead to the development of a new needs assessment, but not necessarily new goals or objectives. It may become unclear why effort is being put into a certain area and a formal needs assessment becomes important to justify an already successful educational strategy. Each of these steps can be important in and of itself and may come into play at different times. The [table 1](#) provides a summary of steps with examples.

Step 1. Needs assessment/statement

The needs assessment helps us answer 'Why'? In the case of curriculum development, the answer may be quite broad and should point to the distinction between the current teaching strategy surrounding a learning need and what should be changed about it.² At the start, it is wise to consider whose needs are the priority. This may start with a learner's needs (either attitudinal and knowledge-based needs, readiness to learn or timing), but likely extends to the patients and communities for whom the learner will be caring. When justifying time or funding, an articulation of how this curriculum might meet regulatory or board requirements can be useful.

The mechanics of a needs assessment includes readily available information and the collection of new information.² The acquisition of new information can be structured (survey or medical knowledge assessment), semi-structured (series of discussions or a call to action based on sentinel event), research/data driven (data on learners' performance or clinical quality data) or based on regulatory requirements.³⁻⁵

Table 1 Curriculum development steps

Curriculum development steps	Description	Specific example
1. Performing a needs assessment and writing a rationale statement	Through focused attention on the current state—medical knowledge, community need, learner time/access—one can develop the right format for assessing needs.	Quality data was used to make a case for a new educational initiative for intern note writing.
2. Determining and prioritising content	Using a variety of sources, drill down a list of key areas of content to be addressed in the curriculum and, if possible, prioritise.	White-Davis <i>et al</i> used a qualitative analysis to mine discussion around the topic of racism in medical education to identify key essential themes to be addressed in the curriculum. ⁶
3. Writing goals and objectives	Goals: broad overview of the content to be covered. Objectives: specific measurable statements that identify the who, what, and when of the goals.	Goal: learners will be able to address the topic of tobacco cessation in all office encounters. Objective: by the end of the curriculum the learner will be able to list the five steps of the ‘5 A’s’ approach to smoking cessation.
4. Selecting teaching/ educational strategies	One should match the learner, teacher and material to one or more of the available teaching formats.	Teaching laceration repair is most beneficial in a hands-on format, whereas assessing basic knowledge of pharmacokinetic rules may be confirmed via web module.
5. Implementation of the curriculum	<ol style="list-style-type: none"> 1. Develop resources 2. Obtain support 3. Design a management plan 4. Anticipate and address barriers 5. Roll out 	Noriea <i>et al</i> used already existing resources to great benefit for their curriculum on health disparities, while also developing external support for their project. ⁸ A great example of a detailed management plan can be seen in their paper.
6. Evaluation and application of lessons learnt	<ol style="list-style-type: none"> 1. Develop a plan to use evaluation results 2. Determine how to measure objectives 3. Collect data 4. Analyse data 5. Use evaluation results 	Malterud <i>et al</i> evaluated a primary care implementation model to better manage depression in primary care. They attend to process measures and utilisation of results to change clinical practice. ¹⁴

A very basic example (see [table 1](#)),² experienced by one of the authors was the identification of a gap in knowledge leading to the development of a newly structured educational activity.

Once the needs assessment is finalised, and the needs have been articulated, a rationale statement should be agreed on.^{3–5} This rationale statement is 1–3 lines that articulates the fundamental findings from the needs assessment to guide the development of the curriculum. The rationale statement can then be used to keep the curriculum on task. It is intended to be modified only if there is a serious oversight in the development. In this way, the needs assessment and rationale statement can truly render a solid foundation for the curriculum in development.

Step 2. Determining and prioritising content

This is the first step in beginning to articulate what is going to be included, a general description of the content, along with a prioritisation of that content. In the example of the communication skills curriculum referenced above, the content was determined both by working backwards from the milestone goals and also from reviewing what experts in the field have identified. In some cases, there will not be expert knowledge or milestones to work from, and

in these cases, original research might be needed, such as surveys of experts in the field, or analysis of conversation around a difficult topic needing to be addressed. An example of this last strategy can be seen in a recent publication on addressing the topic of racism in medical education (see [table 1](#)).^{2,6}

Step 3. Writing goals and objectives

Although goals and objectives are often thought of as similar, there is a nuanced difference to them that should be considered. A goal is a general statement of the knowledge, skill or attitude to be attained by the learner and is often a description of the important content as determined in your earlier steps. In contrast, an objective is a specific measurable skill or attitude that the learner will be able to demonstrate at the end of the educational activity. While goals are helpful in defining the overall strategy, the objectives are necessary in order to measure if your curriculum is successful.

While writing goals is relatively simple, as they are general statements of knowledge, the writing of an objective is more challenging and will be discussed in more detail. Objectives need to be understood by both learners and instructors, and to that end, need to be as specific and measurable as possible.

Table 2 Examples of goals and objectives

Content/topic area	Goal	Poorly written objective	Well-written objective
Pain management	Learners will understand the basic pathophysiology of both acute and chronic pain and be able to apply it to individual patients.	The learner will be able to understand the basic pathophysiology of both acute and chronic pain. The learner will be able to apply their understanding of the pathophysiology to a specific patient diagnosis.	The learner will be able to explain the differences between the pathophysiology of acute versus chronic pain. The learner will be able to appropriately identify whether an individual patient's pain is more likely due to acute versus chronic versus mixed causes.
Smoking cessation	Learners will be able to address the topic of tobacco cessation in all office encounters.	The learner will understand and apply the "5 A's" approach to smoking cessation in a typical office encounter.	By the end of the curriculum, the learner will be able to list the five steps of the '5 A's' approach to smoking cessation and have demonstrated the use of it in a video-taped patient encounter.
Skin biopsy	Learners will be able to demonstrate the most common techniques for performing a skin biopsy including shave, punch and excisional biopsies.	The learner will learn the techniques of shave, punch and excisional biopsies.	By the end of residency, the learner will have demonstrated, under observation, the techniques of shave, punch and excisional skin biopsies and be deemed able to function independently by the observing attending physician.

This statement asks us to simply consider the basic elements of an objective: 'Who will do how much of what by when? (page 51)'.² Perhaps, the most important component of this is the verb, or the 'will do' piece, which should be open to as few interpretations as possible. Good verbs to use may include 'list', 'define', 'execute' and 'differentiate', as opposed to verbs that should be avoided such as 'know', 'understand' or 'appreciate', which are vague and difficult to measure.⁷

Table 2 below provides examples of how an important content area is translated into a goal and an objective and some examples of both poor and well-written objectives.

Step 4. Selecting teaching/educational strategies

Selecting the teaching or educational strategies to deliver new curriculum helps predict its success. One early alignment to consider is the congruence between the topics (knowledge, affective or psychomotor) and teaching method.² Options for curriculum delivery are summarised in table 3. When selecting a strategy, it is helpful to consider both the learner(s) and the teacher(s), as well as the material. If the relationship between teacher and learner is intended to be formative, or longitudinal, the strategy may favour the person teaching and

Table 3 Educational strategies

Type of learning tool	Factors favouring	Factors opposing	Example
Lecture-based information delivery	Learners have lower level basic understanding and limited time.	Learners are more interested in active learning.	Review of biochemical pathways.
Hands-on skill delivery	Learners will apply the skill in real life and benefit directly from practice.	Lack of adequate equipment/space, not a hands-on topic.	Handling a colonoscope before going to the endoscopy suite.
Flipped classroom approach	Learners can acquire knowledge via video or articles, then deepen understanding through discussion.	Requires pre-work, which need time built-in.	Reading an article about the management of gestational hypertension, then discussing it in the setting of a patient with gestational hypertension on the labour and delivery floor.
Case-based lectures	More active learning, favours shared learning.	Not assessing knowledge.	Review of clinical cases seen on a clerkship, presented for discussion.

likely incorporates some element of discussion. If the priority is garnering a basic level of skill/understanding of a stable topic and potentially assessing that knowledge, a web-based tool may be the right approach. When planning multiple sessions, it is helpful to consider overall structure to promote cohesiveness, but with variability between the sessions to meet the educational goals and objectives for that session. In Family Medicine, we are also especially attuned to consider the role of the team in implementation of new teaching, as team-based care is central to the practice of Family Medicine. This may push us to consider cross or interdisciplinary educational approaches. See [tables 2 and 3](#) for examples.

Step 5. Implementation

The implementation phase can be divided into several different steps starting with the identification of resources. Resources fall into four basic categories which include personnel, time, facilities and funding.² Personnel are the teaching faculty, administrative support, informational technology (if needed for computerised modules) and patients (if curriculum involves direct patient care). Time is often one of the most precious resources, given all that learners have to accomplish in the short time they are in school or residency, and includes didactic time as well as the time of all the personnel listed above. Facilities are the spaces such as classrooms or clinic sites where the learning will take place. Funding is all the direct financial costs or faculty compensation, along with any other hidden costs. Utilising existing resources (educational materials already developed, time already put aside in the curriculum, rooms already dedicated to teaching) can lower costs and increase the likelihood of success.

The next step is obtaining support internally from stakeholders to the curriculum, and at times externally, when funding or support for other resources is needed. Stakeholders are those most directly impacted by the curriculum and often include learners, the faculty doing the teaching and any administrative personnel needed. Having their support and enthusiasm is crucial to the success of any curriculum. External support becomes necessary when resources beyond what is available to the programme or school are needed, either financially or in terms of facilities. A great example of finding resources and support is seen in Noriea *et al*, where a curriculum to teach health disparities was developed which used nationally developed resources and partnered with local clinics for the offering of clinical experiences.⁸

The next step is the design of the management plan, which details the actual step-by-step process of how the curriculum will be delivered. This should include the who, what, where and how for each component or teaching strategy. This is where anticipating any barriers that might arise during the role out of the curriculum may be anticipated in advance, with a plan to mitigate the barriers. A great example of this level of detailed plan is also seen in Noriea *et al*'s study where they include a table that details out each didactic component of their

curriculum, along with the assignments to the students and the teaching strategies being employed.⁸

The last step in implementation is the actual role out. This is where all the work you have put in so far will pay off. It is important to pilot sections of the curriculum to enthusiastic stakeholders initially to both gain more support and also to identify and rectify any barriers to implementation so that the odds of success are increased. This pilot can be followed by a phasing-in, where new portions are added until the full curriculum is implemented.

Step 6. Evaluation

Evaluation is a process of determining the merit, value or worth of a programme.⁹ Evaluation is often considered the final phase of curriculum development, but it should span the entire process and is often cyclical and iterative. Two major types of educational evaluation included here are formative and summative.¹⁰ Formative evaluation is conducted early on, or at key points, during a programme in order to inform changes and identify opportunities for improvement. Summative evaluation, however, is an evaluation of outcomes that occurs in a more final phase of implementation. Summative evaluations are useful to make a judgement about whether a curriculum was successful, and for whom, in order to report back to stakeholders. A preparatory step is to consider early on whether to conduct either formative or summative evaluation, or both. Drawing from utilization-focused evaluation¹¹ and the steps in any research process,¹⁰ the major steps of an evaluation are: (1) develop a clear plan to use evaluation results; (2) determine how to measure objectives; (3) collect data; (4) analyse data and (5) use evaluation results by applying lessons learnt.

Although it may seem counterintuitive, the first step of an evaluation is to consider who will use the evaluation results and how. Simply, an evaluation that is never used will not be worth the effort. A utilization plan should include and describe the dissemination plan (eg, a written report, presentations, discussion sections) and the specific audience for each. In addition, the utilization plan should detail what types of actions may be anticipated based on the results. For example, could the report lead to changing, ending or expanding the programme? The actual utilization occurs after the evaluation, but having a clear plan ahead of time can help to ensure the evaluation will actually influence the curriculum, with the goal of improving the learning itself, the experience of the learners and teachers and ultimately, patients and community members who will benefit from more skilled providers.

The next step is to determine how to measure learning objectives. This process is often called assessment and consists of operationalising objectives and determining how to collect data. Consider the learning objective: 'The learner will be able to explain the difference in the pathophysiology of acute versus chronic pain'. Considerations include how to assess this objective, such as through tests, or other learner output. Of course, it must be more

specific, such as whether the test is written or uses another form, the timing of the assessment, whether it will be repeated and what is considered proficiency. A norm-based assessment might compare student performance to other students to determine relative differences. A criterion-based assessment would have a particular cut-point that determines acceptable performance.

With planning efforts completed, the next steps are to collect and analyze data. Data collection might involve tests, interviews with students or instructors, performance assessments or other methods.^{4 10 12} When using quantitative data, analysis occurs after all data have been collected. Analyzing pre-post differences can be particularly helpful in assessing whether learners may have changed. When using qualitative data, analysis begins as data are being collected and tends to be more iterative, with analysis informing subsequent data collection.¹³

The final step is to use the evaluation results and apply lessons learnt to the curriculum. Guided by the utilization plan, this step consists of disseminating information to relevant stakeholders, and making use of the results to improve learning outcomes or the learning experience. This feedback and use of evaluation results is critical for continuing improvement of medical or professional education. Thus, the evaluation process often repeats as educators apply lessons learnt and then evaluate and iterate the improved curriculum.

CONCLUSIONS

Following a systematic approach to develop and evaluate curricula provides a structure to frame teaching and learning and in doing so makes this process accessible to all Family Medicine educators regardless of previous experience. The process may be applied to develop an entirely new curriculum or to modify an existing one. Curriculum development begins with conducting a needs assessment and developing a written rationale for the curriculum followed by determining and prioritising what content will be included in the curriculum. The third step is to clearly articulate the goals and write measurable objectives. Remaining goal oriented helps educators refrain from adding superfluous material. The fourth step is focused on how the curriculum will be delivered by selecting educational strategies. In the fifth step, educators determine what resources are needed on a practical level to implement the curriculum followed by the actual implementation. Finally, educators evaluate the curriculum and use those results to make changes.

The process we have presented encourages Family Medicine educators to systematically move through each

step of curriculum development rather than take an ad hoc approach. By doing so, the educator becomes an expert in both their clinical subject and how best to educate learners in the topic. A structured approach helps ensure the work already being done can be shared widely through publication and presentation, if desired. Through the sharing of the curriculum development process, evaluation results or educational innovations with the broader scholarly community, Family Medicine educators and medical educators generally learn from one another's experiences and the entire field is enriched.

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