



Curriculum Inventory Implementation Guidelines

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Table of Contents

1	Acknowledgements.....	6
2	Overview	8
3	General Guidelines.....	9
3.1	Context Specific Requirements.....	9
3.2	Providing a Visual Schematic of the Curriculum	9
3.3	Identifying Institutions and Programs.....	9
3.4	Transferring Data in Languages other than English	10
3.5	Modeling Your Curriculum in the Standard	10
3.5.1	Modeling Parallel Blocks	11
3.5.2	Modeling Electives	11
3.5.3	Modeling Selectives	12
3.5.4	Modeling Tracks	12
3.5.5	Modeling Courses with Variable Dates	13
3.6	Using Vocabularies.....	13
3.7	Schema Locations.....	14
3.8	Declaring Imported Schema.....	15
3.9	Adapting the Schema to Meet Your Requirements.....	17
3.9.1	Creating a Profile of Curriculum Inventory	17
3.9.2	Extending the Curriculum Inventory Standard	18
4	References	21
5	Glossary.....	22

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2 Overview

The development of health professions education curricula is a time consuming and complex task. Educational reform efforts are encouraging the development of non-traditional curricula that use novel and innovative methods for teaching and assessment. In many institutions there is a push towards competency-based learning as the cornerstone of curriculum development efforts. In addition, health professions reform has mandated that new content or competencies be integrated into the curriculum, including cultural competencies, patient safety, team-based learning, systems-based practice, etc. To facilitate broad curricular reform, it is necessary to enable the aggregation of curriculum data for research and benchmarking purposes.

The MedBiquitous Curriculum Inventory Standard provides a data structure that allows one to represent a health professions curriculum in a standard format. This structure then enables the exchange and aggregation of curriculum data across the continuum of professional education and training.

This implementation guide provides general guidance for common implementations of the MedBiquitous Curriculum Inventory Standard version 1.0. Specific adaptations for your environment may be necessary.

3 General Guidelines

Health professions curricula are often complex. The Curriculum Inventory was designed to be flexible and abstract in order to appropriately represent the wide variety of health professions curricula. This flexibility also means that it requires some planning to implement the Curriculum Inventory within curriculum management systems and curriculum databases.

3.1 Context Specific Requirements

Before implementing the Curriculum Inventory, analyze the context in which it will be used and determine:

1. Which data elements and attributes are necessary to achieve your goals.
2. Whether additional business rules or policies are necessary to achieve your goals.
3. Whether your business partners have additional requirements or business rules or policies.

Often the Curriculum Inventory XML schema may be modified to support context-specific requirements and restrictions. For more information, see “Adapting the Schema to Meet your Requirements.”

3.2 Providing a Visual Schematic of the Curriculum

One comment Curriculum Inventory Implementers have made is that it is difficult to get a sense of the big picture with regards to curricula described using the Curriculum Inventory. Many institutions have developed visual schematics that provide the big picture on how the different components of the curriculum fit together to create a cohesive whole. If your organization has such a schematic, you may incorporate it via reference using the SupportingLink element, or make the visual available within the document referenced by SupportingLink.

3.3 Identifying Institutions and Programs

Identifying institutions and programs across organizations is essential to enable compilation and analysis of curriculum data. When identifying medical schools, MedBiquitous recommends using the FAIMER International Medical Education Directory (IMED) identifier for the medical school in the InstitutionID field. IMED may be accessed at: <https://imed.faimer.org/> When using IMED identifiers, use the domain attribute to indicate that the identifier comes from IMED. For compatibility with the point releases leading to version 2 of the Healthcare Professional Profile, use the following value in the domain attribute when using IMED identifiers: `idd:faimer.edu:imed`

Other organizations may offer unique identifiers for schools of other health professions. In addition, other identifiers will be needed to identify the programs, medical and non-medical, that institutions offer. Agree with your business partners on the unique identifier that will be used for institution and program respectively and document these in your business rules. You should also indicate the domain attribute value that will be used for institution and program ids.

3.4 Transferring Data in Languages other than English

Many implementers may wish to use the Curriculum Inventory Standard to compile data in languages other than English. The standard is designed to support the exchange of curriculum data in languages other than English.

The following elements have a required vocabulary in English: EducationalContext , ClerkshipModel. The values of Educational Context and ClerkshipModel must be in English and must be one of the valid values specified in the Curriculum Inventory Standard.

The Curriculum Inventory Working group recommends that the organization compiling the data create business rules with regard to the following:

- Which languages may be used for data exchange
- What vocabularies will be used for the following elements with recommended vocabularies in English: Profession, Specialty, ResourceType, InstructionalMethod, AssessmentMethod.

Organizations may decide to translate the recommended vocabularies referenced in the standard into other languages. See the section “Using Vocabularies” for more information on the specifics of using translated vocabularies.

3.5 Modeling Your Curriculum in the Standard

When modeling your curriculum in the standard, keep in mind the following principles.

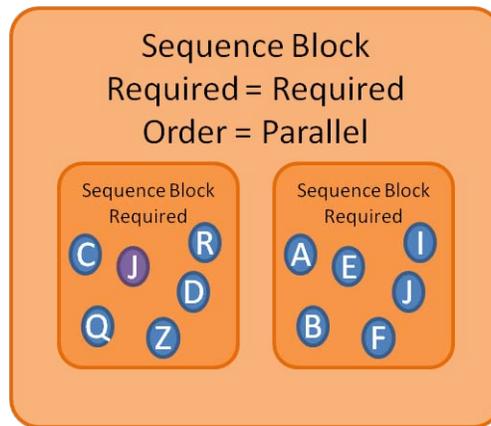
1. Avoid creating duplicate events, sequence blocks, or competency objects. You may reference the same event from multiple sequence blocks. You may reference the same sequence block from multiple sequence blocks. You may reference the same competency object (ie competency/objective/learning outcome) from multiple events, sequence blocks, and competency frameworks.
2. Use competency frameworks to show the relationships among your learning objectives, competencies, and or learning outcomes. You can create multiple competency frameworks I needed and show relationships among the competency frameworks.
3. Sequence blocks may contain many events. To paraphrase, a course may contain many events.
4. Sequence blocks may reference multiple expectations (ie competency/objective/learning outcome)
5. Sequence blocks may contain other sequence blocks. We recommend that you create a sequence block for each phase of the curriculum and reference all of the sequence blocks (ie courses/modules, etc.) that take place within that sequence block.
6. Sequence blocks may be nested to show a course within a phase/module/course/etc.
7. Integration block provide an alternate view of the curriculum organized around integrating themes.

Additional details about modeling commonly used structures follows.

3.5.1 Modeling Parallel Blocks

Many institutions have courses that occur as parallel blocks during a particular time period. Create a “parent” Sequence Block that has the parallel courses as nested sequence blocks. In the parent sequence block, do the following:

- Give the required attribute a value of Required.
- Use the order attribute and give it a value of parallel.

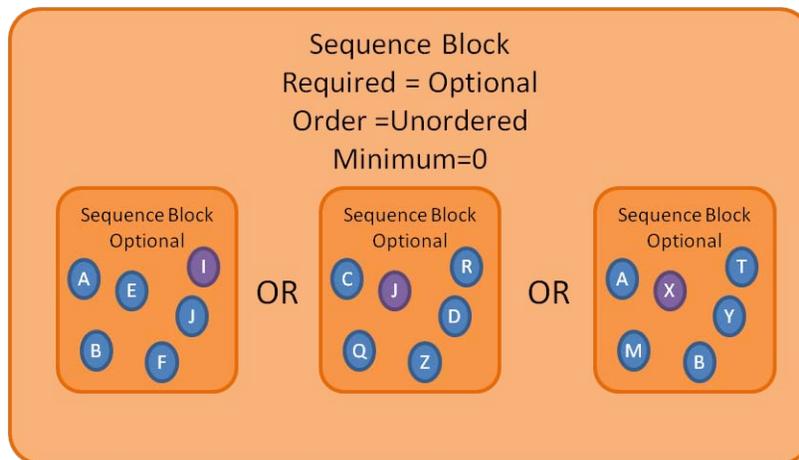


A Parallel Block

3.5.2 Modeling Electives

If there are optional courses that students may take, these may be modeled as electives. Create a “parent” Sequence Block that has the elective courses as nested sequence blocks. In the parent sequence block, do the following:

- Give the required attribute a value of Optional.
- Use the order attribute and give it a value of unordered.
- Use the Minimum attribute and give it a value of 0.

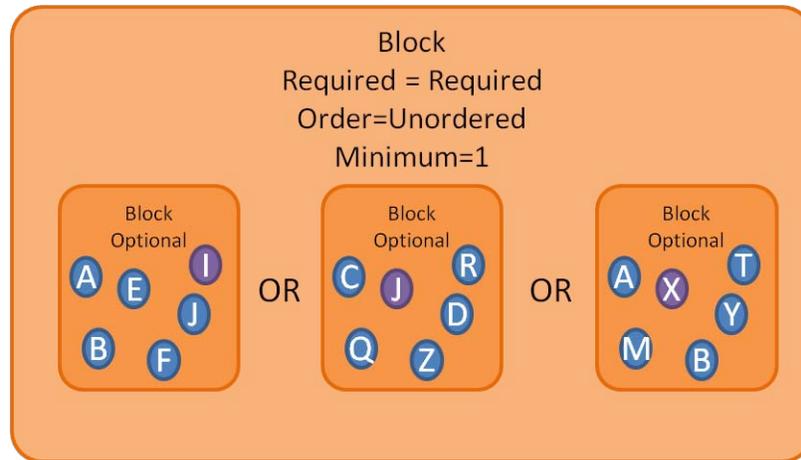


A Block of Electives

3.5.3 Modeling Selectives

If there is a block of courses where each student must participate in a certain number of courses, model those courses as selectives. Create a “parent” Sequence Block that has the selective courses as nested sequence blocks. In the parent sequence block, do the following:

- Give the required attribute a value of Required.
- Use the order attribute and give it a value of Unordered.
- Use the Minimum attribute and give it a value of 1.

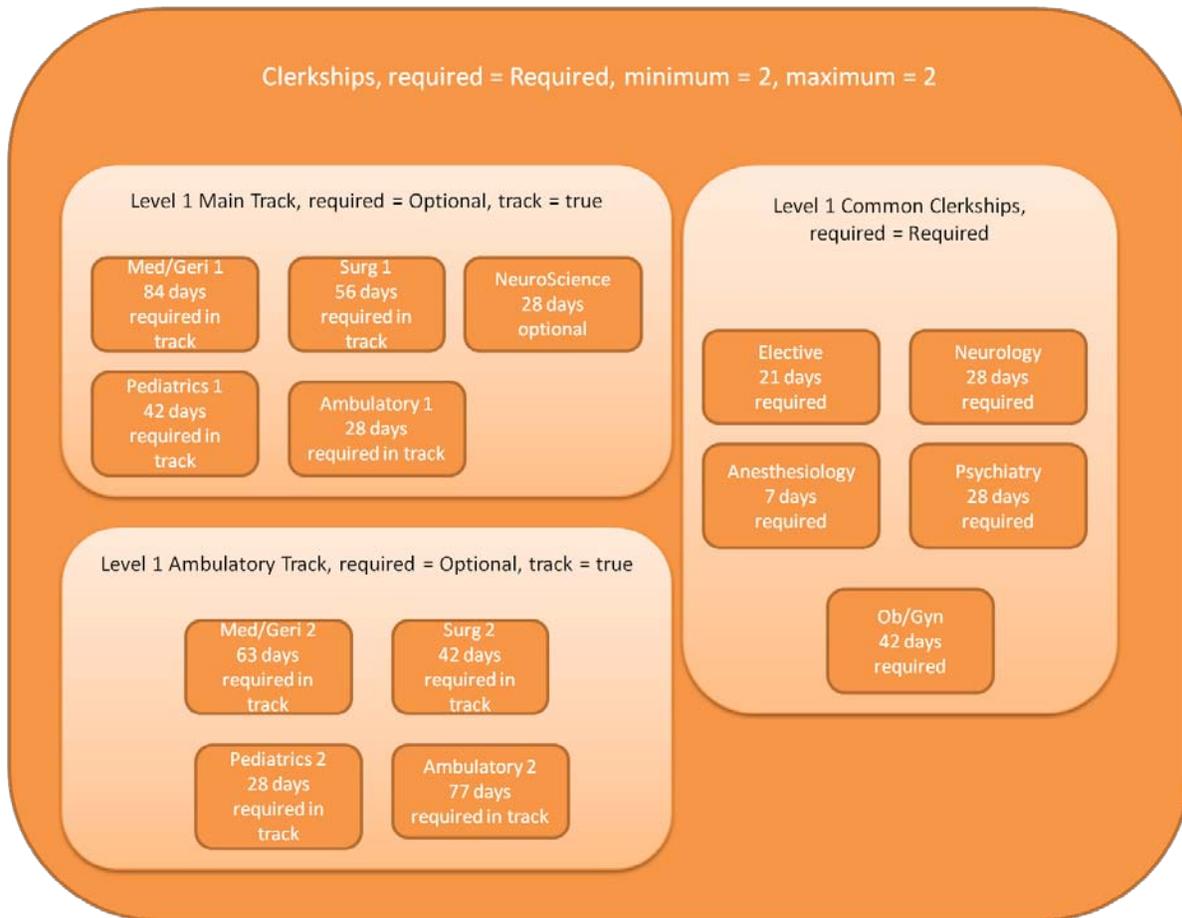


3.5.4 Modeling Tracks

If there is a block of courses that constitute a special track, create a parent sequence block for the main track and the special track. Then create sequence blocks for the special track and the main track and do the following:

- In the parent sequence block, use the minimum and maximum attributes to indicate that students must select either the main track or the special track.
- For the sequence block representing the special track:
 - Give the required attribute a value of Optional.
 - Use the track attribute and give it a value of true.
- For the sequence block representing the main track:
 - Give the required attribute a value of Optional.
 - Use the track attribute and give it a value of true.
- For the sequence blocks within both the special track and the main track, use the RequiredInTrack and Optional values for the required attribute.

If there are courses that are required for all students regardless of track, create a third sequence block within the parent sequence block that is required. The following example shows a clerkship phase of a curriculum that has an Ambulatory track and a Main track. In addition, there are some clerkships that are required of all students, regardless of track.



Example of Tracks in Clerkships

3.5.5 Modeling Courses with Variable Dates

Often times clerkships and other courses happen in rotations, where the course lasts a fixed amount of time but the exact dates of the course will vary based on the sequence assigned to each student (See the figure Example of Tracks in Clerkships). The Timing element in SequenceBlock allows you to indicate the duration of a sequence block and omit specific dates. The Duration element uses the XML schema duration type. A few examples are provided below:

Value	Description
P12M	12 months
P28D	28 days
PT20H	20 hours

3.6 Using Vocabularies

Vocabularies enhance the analysis that can be done on aggregate curriculum data by providing clearly delineated terms from which users can select the terms most appropriate to describe a given characteristic of the curriculum. When users choose non-vocabulary terms, it can be difficult to identify trends and determine commonalities and inconsistencies. Suppose Institution A classifies a course using

the MeSH term Quality Improvement, and Institution B classifies a similar course using the non-MeSH term Performance Improvement. Anyone compiling data using the term Quality Improvement will have an incomplete dataset because data from Institution B's course will be omitted.

MedBiquitous recommends using agreed-upon vocabularies for the following elements:

- Keyword
- Profession
- Specialty
- ResourceType
- InstructionalMethod
- AssessmentMethod

For Profession, Specialty, ResourceType, InstructionalMethod, and AssessmentMethod, we recommend using the source and sourceID attributes to indicate the source of the vocabulary and the unique id for this vocabulary term within that vocabulary. For the keyword element, use the source and id attributes to indicate the source of the vocabulary and the unique id for this vocabulary term within that vocabulary.

3.7 Schema Locations

In order to validate Curriculum Inventory XML documents, you may wish to store all of the associated schemas on a local server and reference those local copies for validation. To use local copies, the schema locations of the following schemas must be changed within the curriculuminventory.xsd schema document.

- competencyframework.xsd
- competencyobject.xsd
- healthcarelom.xsd
- healthcaremetadata.xsd
- healthcarevocabularies.xsd
- member.xsd

Change the schemaLocation attribute of the import element to change the location used for validation. The following example shows import statements that have been changed to use local versions of the schemas. In this example, the xsd files are all in the same directory as the curriculuminventory.xsd file. The schemaLocation attribute may use relative referencing, so the example schemaLocation references the file name since the file is in the same directory.

```
<xsd:import namespace="http://ns.medbiq.org/member/v1/"
schemaLocation="member.xsd"/>
<xsd:import namespace="http://ns.medbiq.org/competencyobject/v1/"
schemaLocation="competencyobject.xsd"/>
<xsd:import namespace="http://ns.medbiq.org/lom/extend/v1/"
schemaLocation="healthcaremetadata.xsd"/>
```

```
<xsd:import namespace="http://ltsc.ieee.org/xsd/LOM"
schemaLocation="healthcarelom.xsd"/>
<xsd:import namespace="http://ns.medbiq.org/competencyframework/v1/"
schemaLocation="competencyframework.xsd"/>
<xsd:import namespace="http://ns.medbiq.org/lom/vocab/v1/"
schemaLocation="healthcarevocabularies.xsd"/>
```

Curriculum Inventory instance documents may then reference the local copy of the curriculuminventory.xsd schema in the schemaLocation attribute of the root element as in the example below. In this example, the curriculuminventory.xsd schema is in the same directory as the instance document.

```
<CurriculumInventory
xsi:schemaLocation="http://ns.medbiq.org/curriculuminventory/v1/
curriculuminventory.xsd"
xmlns="http://ns.medbiq.org/curriculuminventory/v1/"
xmlns:lom="http://ltsc.ieee.org/xsd/LOM"
xmlns:a="http://ns.medbiq.org/address/v1/"
xmlns:cf="http://ns.medbiq.org/competencyframework/v1/"
xmlns:co="http://ns.medbiq.org/competencyobject/v1/"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xmlns:m="http://ns.medbiq.org/member/v1/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

Please note that changing the location of the schemas used for validation does not affect the conformance status of Professional Profile instance document.

3.8 Declaring Imported Schema

The Curriculum Inventory schema imports several schemas for its use. The following schemas must be declared in an instance document when elements from those schemas are included in a Curriculum Inventory instance document:

- address.xsd
- competencyframework.xsd
- competencyobject.xsd
- healthcarelom.xsd
- healthcaredata.xsd
- healthcarevocabularies.xsd
- member.xsd

In the following example, the namespaces associated with these schemas are declared in the root CurriculumInventory element and assigned prefixes to be used when referencing elements from that namespace.

```
<CurriculumInventory
xsi:schemaLocation="http://ns.medbiq.org/curriculuminventory/v1/
```

```

curriculuminventory.xsd"
xmlns="http://ns.medbiq.org/curriculuminventory/v1/"
xmlns:lom="http://ltsc.ieee.org/xsd/LOM"
xmlns:a="http://ns.medbiq.org/address/v1/"
xmlns:cf="http://ns.medbiq.org/competencyframework/v1/"
xmlns:co="http://ns.medbiq.org/competencyobject/v1/"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xmlns:m="http://ns.medbiq.org/member/v1/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <ReportID domain="idd:nosuch.edu:cip">12345</ReportID>
  <Institution>
    <m:InstitutionName>NoSuch University School of
Medicine</m:InstitutionName>
    <m:InstitutionID
domain="idd:aamc.org:institution">987</m:InstitutionID>
    <m:Address>
      <a:StreetAddressLine>720 Main Street</a:StreetAddressLine>
      <a:City>Baltimore</a:City>
      <a:StateOrProvince>MD</a:StateOrProvince>
      <a:PostalCode>21205</a:PostalCode>
      <a:Country>
        <a:CountryCode>US</a:CountryCode>
      </a:Country>
    </m:Address>
  </Institution>
  . . .
  <Events>
    <Event id="E1">
      <Title>White Coat Ceremony</Title>
      <EventDuration>PT2H</EventDuration>
      <Description>First year students are given their white coats to
mark the transition to clinical rotations. The ceremony includes a
declaration of professional values. </Description>
      <Keyword hx:source="MeSH" hx:id="D010817">
        <hx:string>Physician-Patient Relations</hx:string>
      </Keyword>
      <Keyword hx:source="MeSH" hx:id="D012945">
        <hx:string>Social Values</hx:string>
      </Keyword>
      . . .
    </Event>
  </Events>
  <Expectations>
    <CompetencyObject>
      <lom:lom>
        <lom:general>
          <lom:identifier>
            <lom:catalog>URI</lom:catalog>
            <lom:entry>http://nosuchdomain.edu/zxcvb</lom:entry>

```

```

        </lom:identifier>
        <lom:title>
            <lom:string>Professionalism</lom:string>
        </lom:title>
    </lom:general>
</lom:lom>
    <co:Category term="competency domain">
</CompetencyObject>
. . .
<CompetencyFramework>
    <lom:lom>
        <lom:general>
            <lom:identifier>
                <lom:catalog>URI</lom:catalog>
                <lom:entry>http://nosuchdomain.edu/framework</lom:entry>
            </lom:identifier>
        </lom:general>
        <lom:lifeCycle>
            <lom:version>
                <lom:string>1.0</lom:string>
            </lom:version>
        </lom:lifeCycle>
    </lom:lom>
    <cf:Includes>
        <cf:Catalog>URI</cf:Catalog>
        <cf:Entry>http://nosuchdomain.edu/zxcvb</cf:Entry>
    </cf:Includes>
</CompetencyFramework>
</Expectations>
. . .
</CurriculumInventory>

```

3.9 Adapting the Schema to Meet Your Requirements

Organizations implementing the Curriculum Inventory may wish to further restrict the scope of data considered valid or add new data not addressed in the standard. The Curriculum Inventory schema is designed to support either of these scenarios.

3.9.1 Creating a Profile of Curriculum Inventory

If you wish to further restrict the scope of data deemed valid for a particular use of the Curriculum Inventory Standard, you may create a profile of the Curriculum Inventory Standard. The XML documents developed based on the profile must validate against the original Curriculum Inventory XSD file in order for the profile to be valid.

1. **Identify the restrictions that you wish to make to the schema.** The following are a few examples of restrictions that may be included in a profile:
 - a. Making recommended vocabularies required vocabularies.
 - b. Further restricting the contents of free text elements or attributes.

- c. Further restricting the contents of elements or attributes with required vocabularies (for example, permitting only 2 of the values in a list with 10 values)
 - d. Placing limits on the range of acceptable values for elements with numeric values.
 - e. Eliminating optional elements or attributes that will not be used.
 - f. Requiring optional elements or attributes that must always be used.
2. **Create a version of the curriculuminventory.xsd file that implements your restrictions.**
We recommend changing the name of the resulting XSD file and describing the restrictions made in annotations within the XSD file.
 3. **Document your profile of the Curriculum Inventory Standard.**
Be sure to indicate that it is a profile of the standard, indicating the changes made and providing appropriate copyright references.

3.9.2 Extending the Curriculum Inventory Standard

The Curriculum Inventory schema allows for elements from other namespaces to be included under the root element. Use the steps that follow to extend the Curriculum Inventory schema to incorporate new data.

1. **Write a new XML schema for new data elements and declare a targetNamespace.**
Develop a new XSD schema that defines the data elements that are missing from the Curriculum Inventory. All new elements must be associated with a namespace. This can be achieved by using the XSD targetNamespace attribute. The following example defines an element called CurriculumDean that can be used to identify the Dean in charge of curriculum. The schema defines http://ns.myurl.com/curriculumdean/ as the targetNamespace, so the CurriculumDean element is associated with that namespace.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://ns.myurl.com/curriculumdean/"
xmlns="http://ns.myurl.com/curriculumdean/"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:element name="CurriculumDean" type="xs:string"/>
</xs:schema>
```

2. **Place new namespace qualified elements below the root at the end of the XML instance document.**
Declare the namespace of the schema with new data elements in the instance document. Usually this is done by declaring the namespace in the root element and assigning a prefix to the namespace. Then the prefix can be used when referencing the new elements. You may also declare a default namespace for an element and its subelements by declaring the namespace in the uppermost element belonging to that namespace. Then include the new element(s) just before the closing CurriculumInventory tag.

In the example below, the prefix cd is declared for the <http://ns.myurl.com/curriculumdean/> namespace within the CurriculumInventory root element. The cd prefix is then used to label the CurriculumDean element before the closing CurriculumInventory tag.

```
<CurriculumInventory
  xsi:schemaLocation="http://ns.medbiq.org/curriculuminventory/v1/
  curriculuminventory.xsd"
  xmlns="http://ns.medbiq.org/curriculuminventory/v1/"
  xmlns:cd="http://ns.myurl.com/curriculumdean/"
  xmlns:lom="http://ltsc.ieee.org/xsd/LOM"
  xmlns:a="http://ns.medbiq.org/address/v1/"
  xmlns:cf="http://ns.medbiq.org/competencyframework/v1/"
  xmlns:co="http://ns.medbiq.org/competencyobject/v1/"
  xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
  xmlns:m="http://ns.medbiq.org/member/v1/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <ReportID>12345</ReportID>
  <Institution>
  . . .
  </Institution>
  <Program>
    <ProgramName>M.D.</ProgramName>
    <ProgramID domain="idd:aamc.org:cip">5678</ProgramID>
  </Program>
  <Title>Johns Hopkins School of Medicine Genes to Society Curriculum
  2010-2011</Title>
  <ReportDate>2011-07-01</ReportDate>
  <ReportingStartDate>2010-07-01</ReportingStartDate>
  <ReportingEndDate>2011-06-30</ReportingEndDate>
  <Language>en-us</Language>
  <Description>The Genes to Society curriculum reframes the context of
  health and illness more broadly, to encourage students to explore the
  biologic properties of a patient's health within a larger, integrated
  system including social, cultural, psychological, and environmental
  variables.</Description>
  <SupportingLink>http://www.hopkinsmedicine.org/crc/</SupportingLink>
  <Events>
    <Event>
    . . .
    </Event>
    <Event>
    . . .
    </Event>
  </Events>
  <Expectations>
    <CompetencyObject>
    . . .
    </CompetencyObject>
```

```
<CompetencyObject>
  . . .
</CompetencyObject>
</Expectations>
<AcademicLevels>
  . . .
</AcademicLevels>
<Sequence>
  <SequenceBlock>
    . . .
  </SequenceBlock>
  <SequenceBlock>
    . . .
  </SequenceBlock>
</Sequence>
</Integration>
  <IntegrationBlock>
    . . .
  </IntegrationBlock>
  <IntegrationBlock>
    . . .
  </IntegrationBlock>
</Integration>
<cd:CurriculumDean>William Blake</cd:CurriculumDean>
</CurriculumInventory>
```

4 References

Competency Framework

MedBiquitous Competency Framework Specifications and Description Document. MedBiquitous website.

http://www.medbiq.org/working_groups/competencies/CompetencyFrameworkSpecification.pdf.

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Competency Object

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5 Glossary

To ensure clarity and consistency, we provide working definitions of the terminology we use in these guidelines.

- **Competency Framework** – an organized and structured representation of a set of interrelated and purposeful competency objects.
- **Competency Object** – an umbrella term used to describe any abstract statement of learning or performance expectations, and information related to the statement. Statements can be learning outcomes, competencies per se, learning objectives, professional roles, topics, classifications/collections, etc. The Competency Object may include additional data to expand on or support the statement. The Object is abstract in the sense that it does not inherently contain information about connections of the statement to individuals or events or other objects.
- **Event** – a single education or assessment activity documented in a curriculum. Examples of events include: lecture, problem-based learning activity, virtual patient activity, Simulation activity, seminar, lab, and bedside learning activity, to name a few.
- **Expectation** – the competencies, learning objectives, and learning outcomes implemented in a curriculum and how they are organized into competency frameworks.
- **Integration Block** – An integrating concept for a curriculum, such as a theme.
- **Sequence Block** – an organizational component of a curriculum, such as a year, phase, course, module, etc. Sequence blocks can be nested to show a variety of organizational methods.