

## **Introduction**

These modules were developed by the Maryland State Department of Education, with the support of a four-year Race to the Top grant, "World Languages Pipelines." Preliminary planning took place in a workshop setting, as world language and ELL teachers collaborated with classroom teachers, STEM consultants, and workshop leaders to design the modules. The modules were subsequently edited, revised, and translated or adapted into Chinese, Spanish, and Arabic.

## **Role of the Modules in Local Curriculum**

The purpose of the modules is to provide materials for teachers who wish to integrate STEM content into their world language and ELL classrooms.

**S**cience

**T**echnology

**E**ngineering

**M**athematics

The modules are examples of content-related or content-connected instruction. It is not their purpose to take responsibility for a certain segment of STEM instruction; rather, they reinforce the STEM curriculum while balancing STEM content with the equally important priorities of language development and experiences with culture. The modules are also not designed to be a curriculum. They should be integrated with existing curriculum where teachers find the most appropriate fit. In some cases teachers may find that a module they have chosen incorporates the STEM content of an earlier grade. This may be viewed as a good opportunity to review familiar concepts while learning new language to surround and express it. Thus many of the modules might be used at several different grade levels. STEM content from a grade level above that of students in the classroom, however, may not adapt quite so easily.

It is important that ELL and world language lessons present STEM content that is developmentally appropriate, accurate, and not merely superficial. This may often require deeper knowledge or more extensive research than the typical world language or ELL teacher can draw from. These modules have benefited from both research and the expertise of STEM consultants; and are aligned with the Maryland Common Core State Standards (MCCSS) for Mathematics and Next Generation Standards of Science. They can be used with confidence in the classroom.

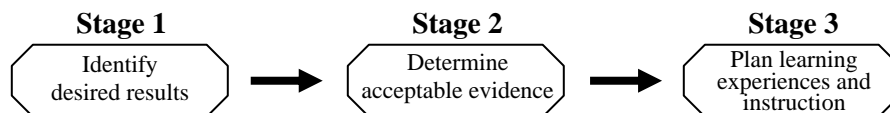
## **Guiding Principles**

The concepts guiding module development were discussed in workshops and implemented by writers, editors, and translators. They are identified briefly here and elaborated in the workshop materials available from the links provided after each brief description.

### ***Understanding by Design/Backward Design***

The principles of backward planning/backward design, as developed in the work of Grant Wiggins and Jay McTighe, require the planner to focus first on the most important aspects of what is to be taught and determine the desired results of instruction. The next step is to decide

how students will demonstrate that they have achieved these results. Only then are the specific learning experiences and activities developed to promote understanding, interest, and excellence.



**Stage 1** in the modules is identified by the *Enduring Understanding/s* and the *Essential Question/s*. The term “Enduring Understanding” refers to the key element of the module that has lasting value, beyond this module and beyond the classroom; that is, what is worthy of understanding and also requires understanding. The “Essential Question” expresses the actual goal of the unit, stated as a question and in terms a student will understand. There may be more than one Enduring Understanding (EU), and there is often more than one Essential Question (EQ).

**Stage 2** is found in the descriptions of the Performance Assessment, most of which will take place at the end of the module.

**Stage 3** is developed through detailed instructions for each lesson within the module.

### ***Standards for Foreign Language Learning in the 21<sup>st</sup> Century***

Developed by a collaborative of teachers from the American Council on the Teaching of Foreign Languages (ACTFL) and from language-specific organizations for ten different languages, these standards set out a vision for instruction that attends to five major goals for language learning:

- Communication: Communicate in Languages Other Than English
- Cultures: Gain Knowledge and Understanding of Other Cultures
- Connections: Connect with Other Disciplines and Acquire Information
- Comparisons: Develop Insight into the Nature of Language and Culture
- Communities: Participate in Multilingual Communities at Home and Around the World

The Communication goal is supported by three standards:

- 1.1: Interpersonal communication, both written and oral
- 1.2: Interpretive communication, both reading and listening
- 1.3: Presentational communication, both writing and speaking

Each of the other four goals is supported by two standards.

Goals and Standards are identified for each of the modules, and the Performance Assessment includes assessment strategies for each of the Standards for communication: Interpersonal, Interpretive, and Presentational.

### ***Story Form***

Drawn from the work of Kieran Egan, story form as a design element calls for every module, lesson, or activity to incorporate the characteristics of a good story. In each case it should:

- appeal to the emotions, and not just to the intellect.
- be personally meaningful, to the student and also to the teacher.
- spark the imagination

- have a satisfying conclusion. Like the gymnast who “sticks” a landing, the student can demonstrate and feel, “Look what I’ve done! Look what I can do! Look what I’ve learned!”
- have a clear Beginning, Middle, and End.

A sense of purpose should propel instruction and learning forward.

### ***Principles of STEM Curriculum Design***

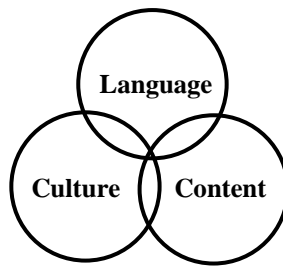
The STEM content for these modules is based on the Maryland Common Core State Standards for Mathematics and the Next Generation Standards of Science. The format of the lessons incorporates the key elements of STEM design, commonly known as 5Es, within the structure of a language lesson:

1. Engagement
2. Explanation
3. Exploration
4. Elaboration
5. Evaluation

These elements correspond well with the story form explained above, fitting nicely into the beginning, middle, and end cycle. The 5Es are embedded in the design and implementation of the five lessons in each module.

### ***Principles of World Language Curriculum Balance***

The methods textbook *Languages and Children: Making the Match* makes the case for balancing linguistic and cultural goals with reinforcement and enrichment of the content of the general elementary school curriculum. To emphasize one goal at the expense of the other two limits the potential of the program. For example, language without culture or content integration lacks context and motivation. Culture without adequate language support becomes a social studies class and language development is limited; without reference to curriculum content the context of language is very limited. Content emphasis without attention to language and culture fails to open doors to new ways of thinking, communicating, and being in the world.



### **A Word about Culture, Language, and Content**

Since language is such an important expression of culture, it is imperative that the language in the classroom be authentic and consistent. Students can learn and use correct target language terms for STEM concepts, and they will learn those concepts successfully through the target language if that language is used for all aspects of instruction and combined with ample illustrations and hands-on experiences. Briefly stated, students need to be surrounded by their new language during the language class.

At the same time, culture is more than the language alone. Children need experiences with cultural products and practices, so they can begin to appreciate the perspectives of the people whose language they are learning. Because of the process used in developing these modules, the cultural dimension may not always be as clearly evident as the classroom teacher would wish. To strengthen the cultural element, teachers can use realia and visuals from the target culture wherever possible, and enrich the modules with rhymes, songs, and stories from the cultures and communities where the target language is spoken. Opening and closing routines might also incorporate rich cultural components.

*Examples of cultural enrichment for the Moon module:*

- After reading the story book, use a culture-based legend or folktale about the moon.
- Use a culture-based target language calendar to calculate moon phases.
- Build in any culture-based festivals associated with the moon.
- Use folk or other cultural artists' drawings in the class and determine the phase of the moon depicted.

### **Structure of the Modules**

Most STEM modules include the following components:

Overview of the module

- Target Language and Grade Level
- Targeted proficiency level
- Context and story line
- Enduring Understanding
- Essential Question/s
- Module Duration and Lessons
- Targeted Standards, both World Language Standards and STEM Standards
- Knowledge and Skills: Vocabulary and “Can Do” Statements
- Performance Assessment, including Interpersonal, Interpretive, and Presentational Communication
- Materials and Resources
- STEM Background information for teachers

Lesson Plans

- Objectives
- Vocabulary and Expressions
- Materials/Resources
- Lesson Story Line and Core Text
- Procedures, organized according to the STEM key elements
- Detailed Performance Assessment
- Teacher Reflection

## **How to Use These Modules**

Many resources are available to teachers as they plan to use these modules. Online materials were used by writers and are also available to any teacher wishing to use them. Some of these materials are listed at the end of this introduction.

### ***Assumptions about Instruction***

These modules are designed for use of the target language at least 90-100 percent of the time, for all classroom purposes. For ELL classrooms, in general, English will be used all the time. Many of the activities in the lessons are variations on the strategies of Natural Approach and Total Physical Response. As teachers adapt these modules to their own classrooms and develop additional activities of their own, they may find it one of the handouts from the workshops to be especially useful: “Ideas for Introducing and Practicing the Building Blocks of Language.”

Teachers should read the entire module before beginning its use in the classroom and assemble materials in advance. Most modules call for materials easily available within the school or at home, but some also include more specialized materials. It may also happen that an important item was inadvertently omitted from the materials list at the beginning of the module or the lesson.

Modules are designed for specific grade levels, but most are adaptable for other grades, as well. In every case, teachers will need to adapt the module to some extent to make it appropriate for their own classroom. This may include changing vocabulary or expressions to make them more compatible with what the class has already learned.

### ***Beginning and Ending Routines***

Routines for the beginning and ending of each class period are important parts of every lesson, as they provide a sense of “beginning, middle, and end” to help make the learning memorable.. Beginning routines gather student attention, preview important parts of the lesson to come, and link with previously learned language and content. They often include calendar work, reference to the weather, and a welcome song. Ending routines may revisit important parts of the lesson and often incorporate some elements of performance assessment. In many cases teachers find that a “goodbye” song is a good way to signal the end of class. Students should leave the class feeling success in what they have learned and accomplished.

Although some modules include suggestions for these routines, in most cases the beginning and ending routines are not fully described. The classroom teacher is in the best position to determine what previous learning best links to the new lesson and what familiar songs and activities give students the sense of order and comfort that is so important for young children. These routines may also be a good place to integrate additional culture-based materials.

### ***Demonstrations and Experiments***

These modules make extensive use of demonstrations and hands-on experiences to integrate the learning of language, content, and culture. Through actual “doing” in the target language, students remember the learning beyond classroom. STEM concepts are well adapted to

integration with language learning, because these hands-on experiences and demonstrations make it possible to deal with meaningful content in a way that is well adapted for novice language learners.

Teachers are urged to try every demonstration and experiment themselves, well before it is used in class. Sometimes they will find that additional instructions are needed for their own classrooms. In other cases they may find that the activity does not work as described, or that it takes too long for the time available, or that for some reason it is simply impractical for their students. With primary school children the teacher may also discover that additional preparation is needed, such as getting student materials ready ahead of time. Some teachers will find it necessary to adapt directions and explanations to the language and developmental level of the children in their classrooms.

### ***Making the Most of Rhythm and Music***

Many of the modules make generous use of chants as a tool for practicing new language and content and making them memorable. The rhythm that makes chants so engaging is also present in raps and culture-based songs and rhymes. Children enjoy repeating and performing chants and songs, especially when they are accompanied by actions. If the chant or song is also associated with a game, the impact is even stronger. The tools of rhythm and music have been used as anchors for important information throughout the history of civilization.

To be most effective, chants and songs should be presented after most of the vocabulary and concepts have already been introduced. They should incorporate important language that can be reused in many contexts beyond the chant or song itself. One very useful strategy for introducing a chant is a call-and-response pattern. The teacher/leader presents the chant one line at a time, complete with actions if appropriate, and the class repeats. After students become familiar with the chant, student volunteers may become the chant leaders. A similar strategy may be used for introducing a song, although the class will begin to sing a song independently or with the teacher much more quickly.

If a chant or song has several segments, representing new learning over the course of the module, it is most effective to introduce new segments or verses separately, after the new learning has taken place. Then the segments can be combined to provide a complete experience. When children are encouraged to develop rhythmic accompaniment for a song or a chant, the experience becomes even more meaningful and memorable. Clapping, slapping knees, stamping feet, or using rhythm instruments borrowed from a music class can contribute to the fun.

### ***Work in Progress***

These modules have been developed thoughtfully to provide a resource for language teachers who wish to enrich their classrooms with STEM content and integrated materials. Each one is still a work in progress. As teachers use the materials and add their own ideas, demonstrations, and activities, they are invited to share their ideas and experiences with the Maryland Department of Education. In this way the modules can grow in richness and usefulness.

[http://marylandpublicschools.org/MSDE/divisions/instruction/wl\\_escm.htm](http://marylandpublicschools.org/MSDE/divisions/instruction/wl_escm.htm)