Welcome to the Microcredential course on Integrating CS into a Core Content Lesson

Welcome to the microcredential course on **Integrating Computer Science into a Core Content Lesson Plan**!

You may submit your Integrated Lesson Plan (the culminating assignment for this course) at any time. You may already have ideas about developing integrated lesson plans, or you may wish to complete the four computer science content-specific courses first, each of which are aligned with one or more of the six CS SOL strands.

The four computer science content courses are:

- Introduction to Computing, Digital Impact, and Digital Citizenship
- Computing Systems, Networks and the Internet, and Cybersecurity
- Algorithms and Programming
- Data and Analysis

We are using the abbreviation **CSLI** (Computer Science Lesson Integration) to differentiate this course from the others, so you will see that acronym used throughout the course.

This microcredential course is formatted into one main section, the **Integrated Lesson Plan Assignment**, which contains two features:

- **Course Materials**, comprised of content and resources for designed to help you develop your Integrated Lesson Plan
- **Integrated Lesson Planning Instructions and Resources** - resources (template, rubric, etc.) for developing your integrated lesson plan for the course and a link to submit your Integrated Lesson Plan and accompanying self-reflection

For maximum benefit, we recommend that you step through the materials in the Course Materials folder in the order presented. **Though not necessary, it is also a good idea to have the materials you received during the CodeVA K-5 Coaches Academy on hand.**

Here is what to do:

- Click sequentially through the information including in the Course Materials folder. Complete and submit the assignment where indicated.
- Develop an Integrated Lesson Plan using the resources and templates provided and upload it along with your self-reflection where indicated.

If you need assistance at any time, please email tcep@odu.edu. Good luck!

CSLI Course Materials

This section contains content and resources describing what CS integration may look like to help you think about CS integration in the elementary classroom.

Use the Next and Previous buttons below to navigate through this section.

1. Overview of integration

View the attached PDF to learn about different ways to think about integrating computer science standards into one or more other subject areas.

ARCS CSLI Content 1.pdf **(https://canvas.odu.edu/courses/185317/files/44846318/download?wrap=1)**

⤓ **(https://canvas.odu.edu/courses/185317/files/44846318/download?download_frd=1)**

ARCS Microcredential: Lesson Integration

What is integration?

This presentation reviews various models of integration. After viewing, you will be able to choose an approach that works for you.
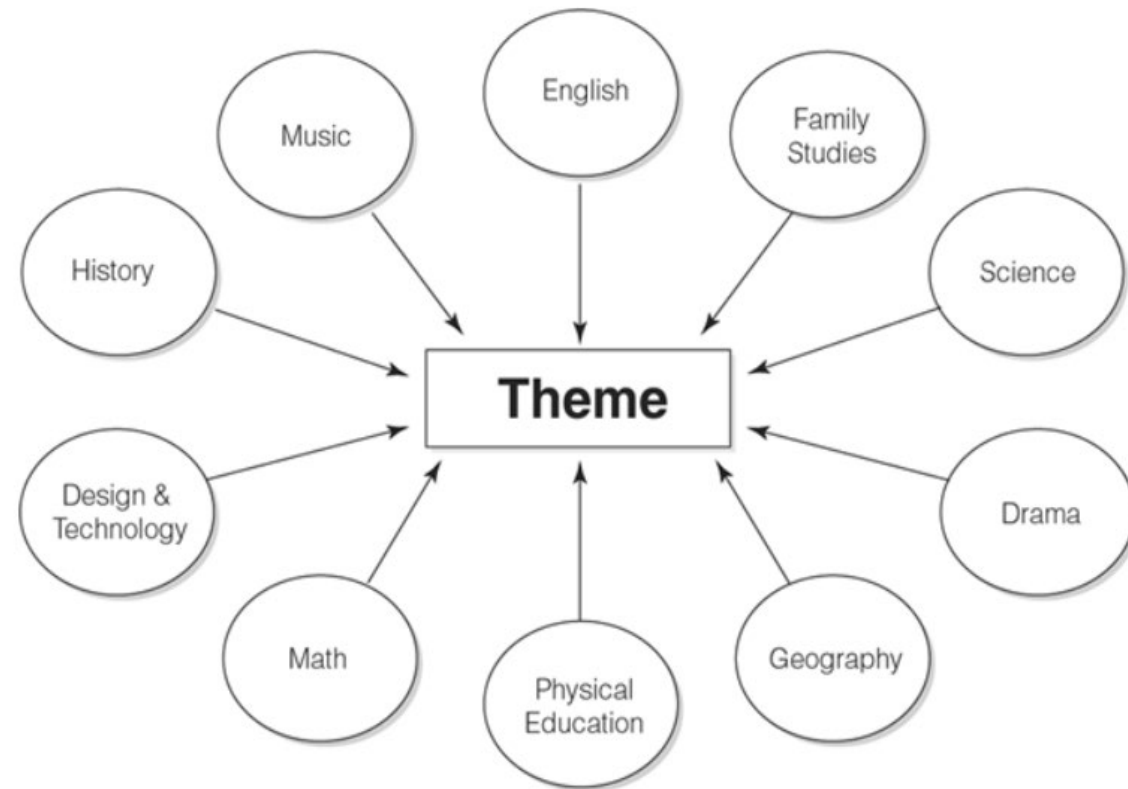
On a sheet of paper, draw how you visualize the relationship between core content and computer science

In a multidisciplinary approach, a common theme is used to guide the selection of content.

Ex. A theme-based lesson or unit.
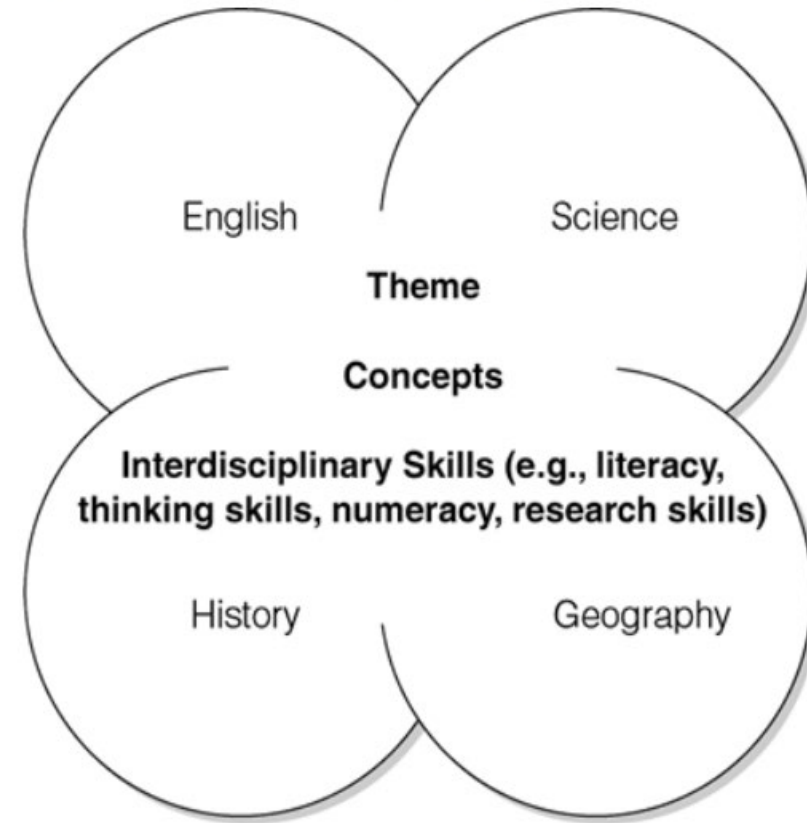
Figure 1.1. The Multidisciplinary Approach

Content adapted from
http://www.ascd.org/publications/books/103011/chapters/What-Is-Integrated-Curriculum%C2%A2.aspx

In an interdisciplinary approach, common skills and concepts are emphasized.
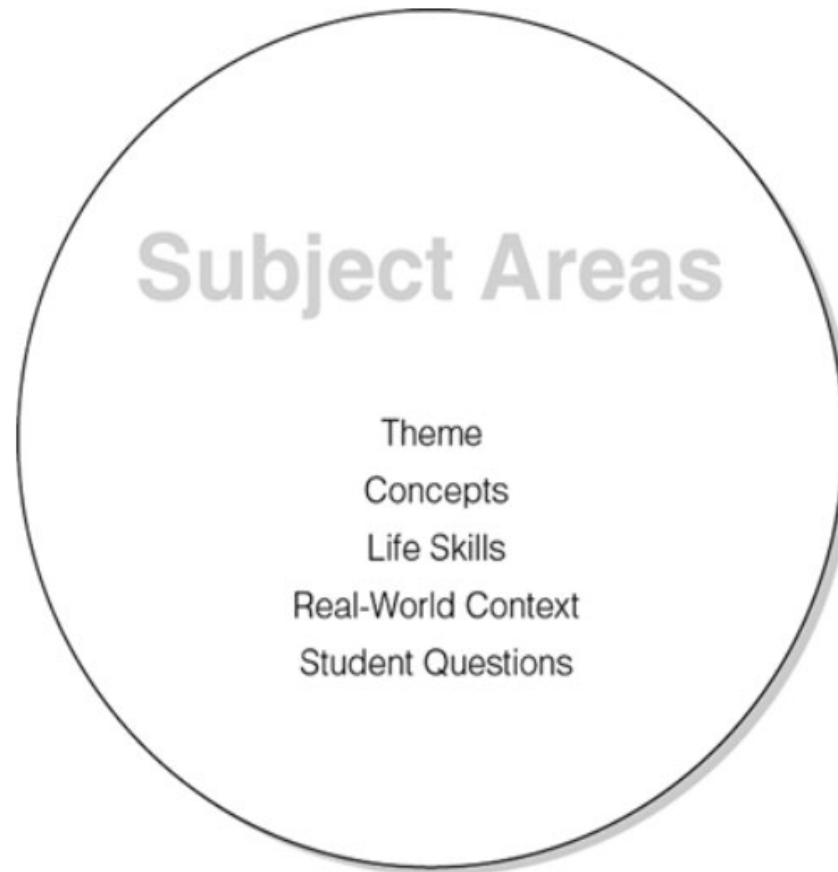
Ex. Encountering skills or content as a "big idea" in multiple subject areas

Figure 1.2. The Interdisciplinary Approach

English   Science

Theme

Concepts

Interdisciplinary Skills (e.g., literacy, thinking skills, numeracy, research skills)

History   Geography

Content adapted from
http://www.ascd.org/publications/books/103011/chapters/What-Is-Integrated-Curriculum%C2%A2.aspx

Figure 1.3. Transdisciplinary Approach

Subject Areas

Theme
Concepts
Life Skills
Real-World Context
Student Questions

In a transdisciplinary approach, real life context and student questions are used to organize content.

Ex. Problem Based Learning

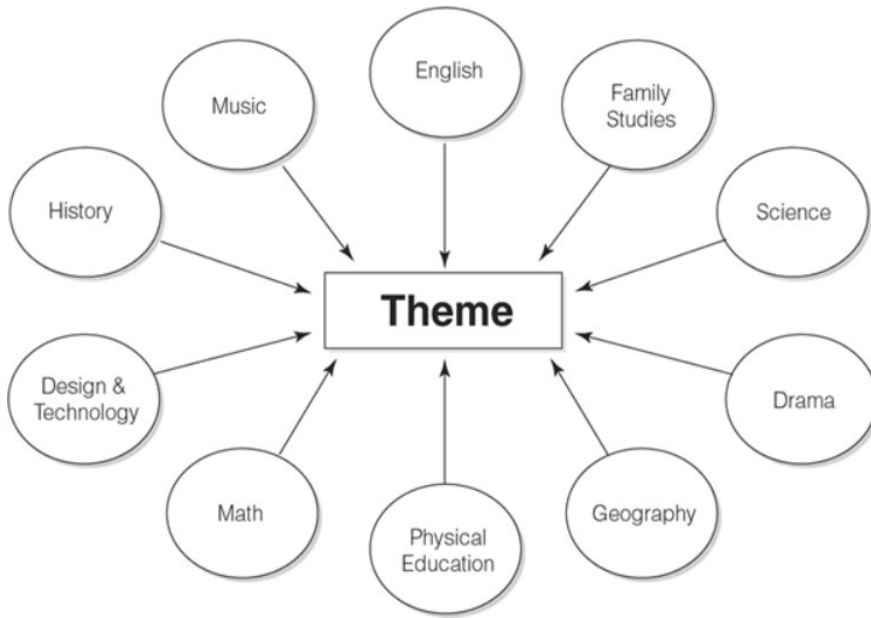Figure 1.1. The Multidisciplinary Approach

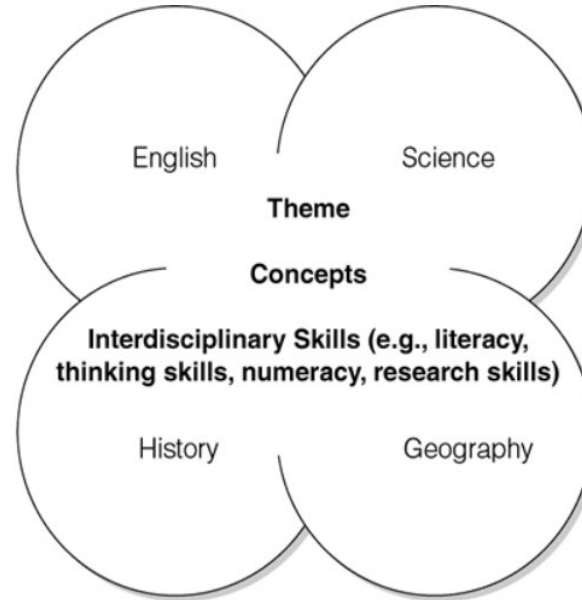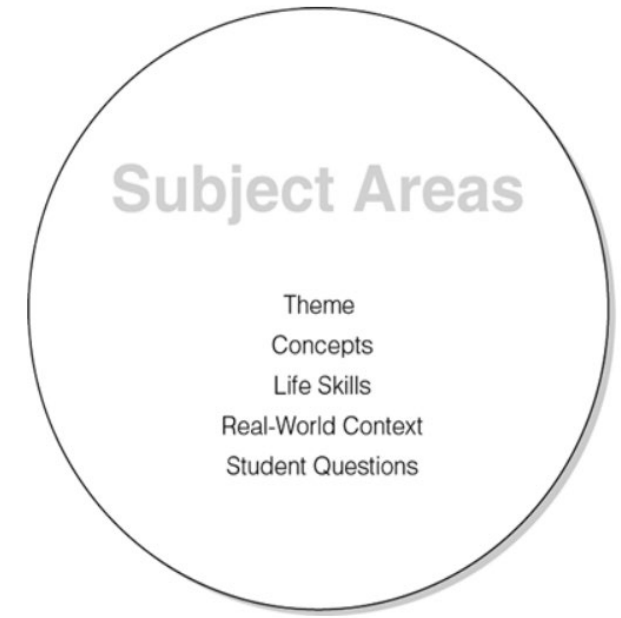Figure 1.2. The Interdisciplinary Approach

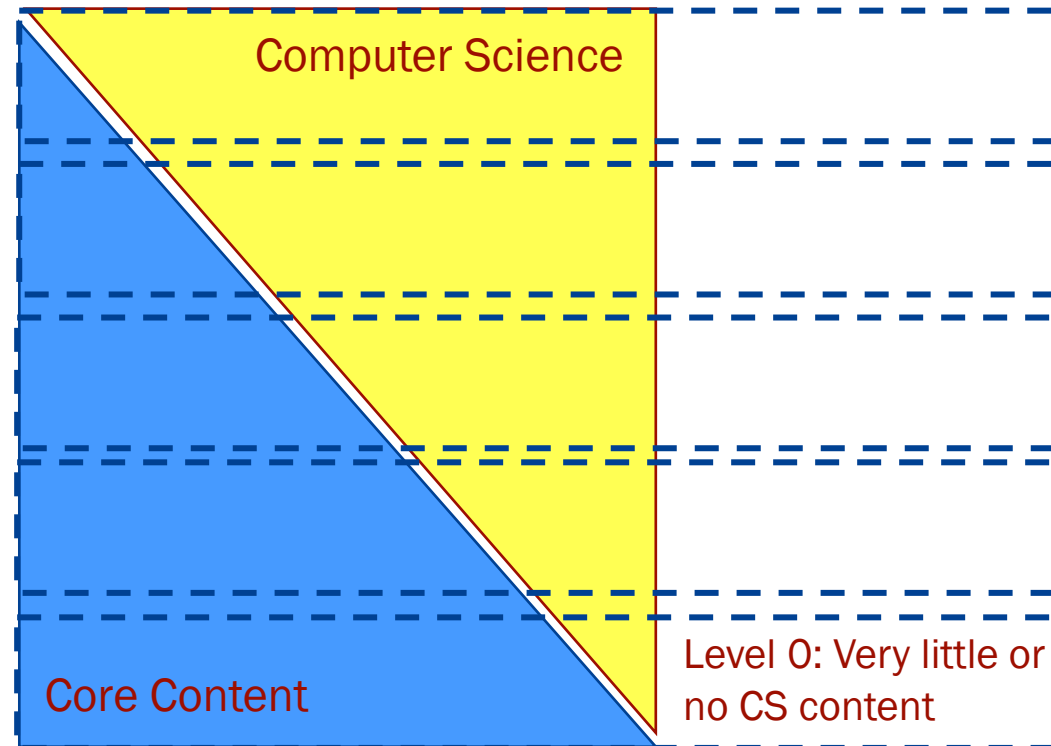Figure 1.3. Transdisciplinary Approach

History

Music

English

Family Studies

Science

Design & Technology

Theme

Drama

Math

Physical Education

Geography

English

Science

Theme

Concepts

Interdisciplinary Skills (e.g., literacy, thinking skills, numeracy, research skills)

History

Geography

Subject Areas

Theme
Concepts
Life Skills
Real-World Context
Student Questions

All of these approaches reflect integration!

Level 0

- At this level, the instructional goal of the lesson is mostly or all about the core content. CS might support core content learning, for example through the use of a tool.

Computer Science

Core Content

Level 0: Very little or no CS content

Adapted from Code VA's *Integration Planning Guide*

Level 1

Computer Science

Level 1: CS content supports core content
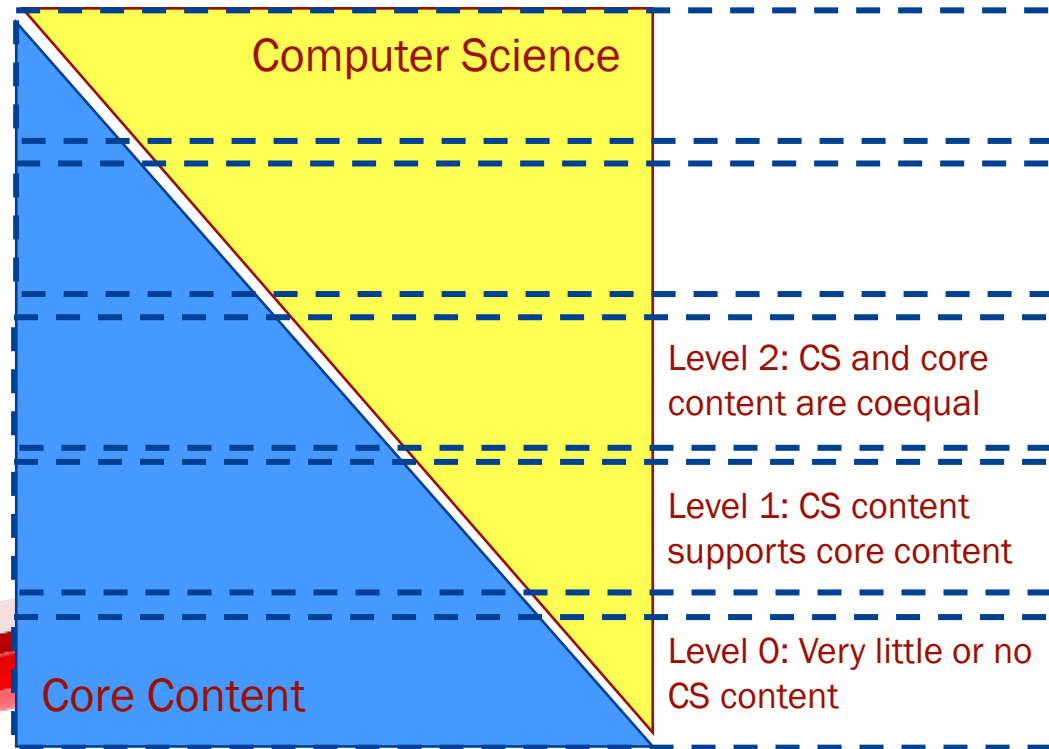
Level 0: Very little or no CS content
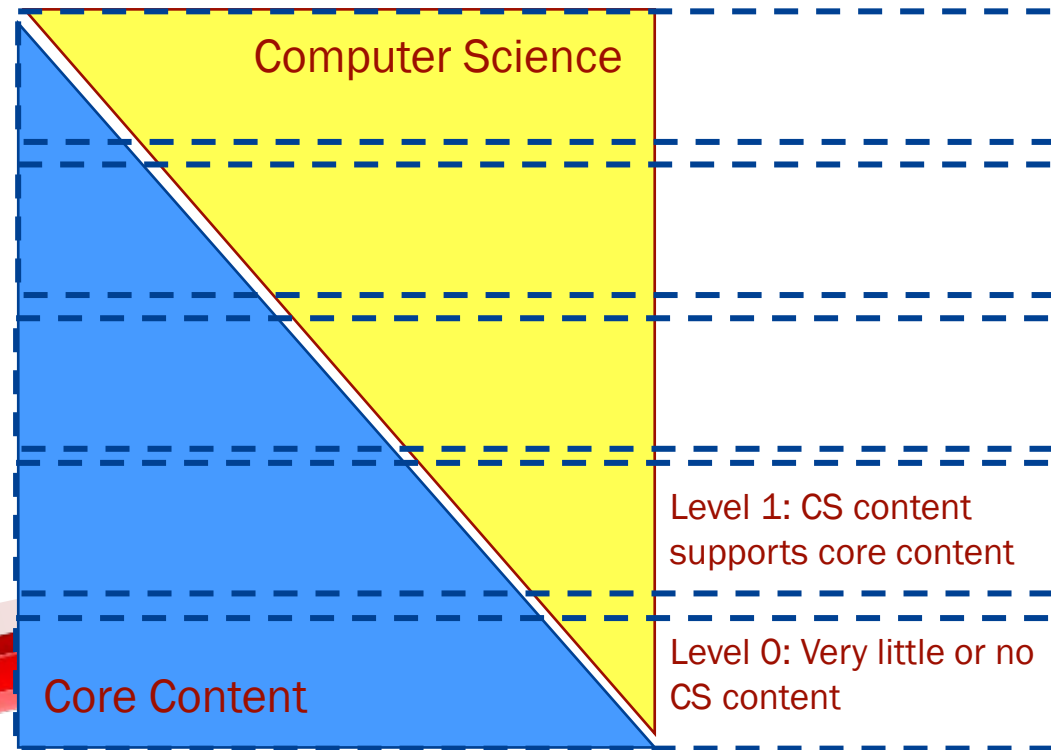
Core Content

- At this level, the instructional goal of the lesson includes a supporting role for CS content including vocabulary. Students may apply existing CS knowledge and skills when learning core content.

Adapted from Code VA's *Integration Planning Guide*

Computer Science

Level 2: CS and core content are coequal

Level 1: CS content supports core content
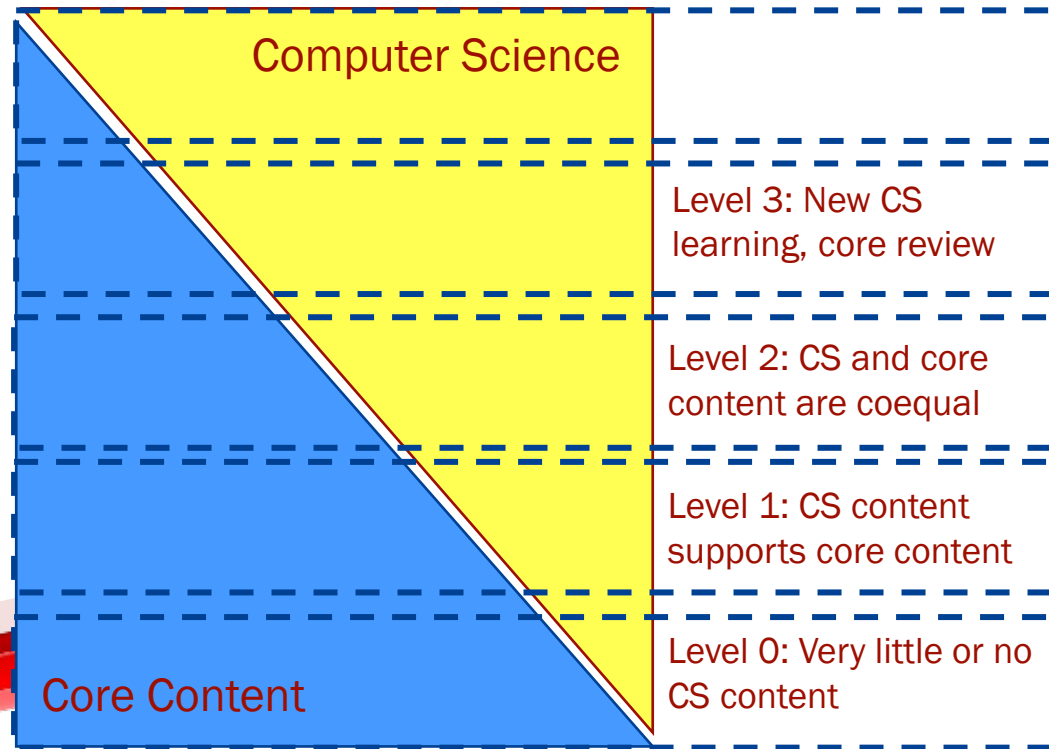
Level 0: Very little or no CS content

Core Content

Level 2

- At this level, the instructional goal of the lesson includes new CS learning *and* new core content area learning. For example, students may learn about parallels between a computing concept (e.g. looping in an algorithm) and a core content area concept (e.g. repeating steps when solving a math problem).

Adapted from Code VA's *Integration Planning Guide*

Computer Science

Level 3: New CS learning, core review

Level 2: CS and core content are coequal

Level 1: CS content supports core content
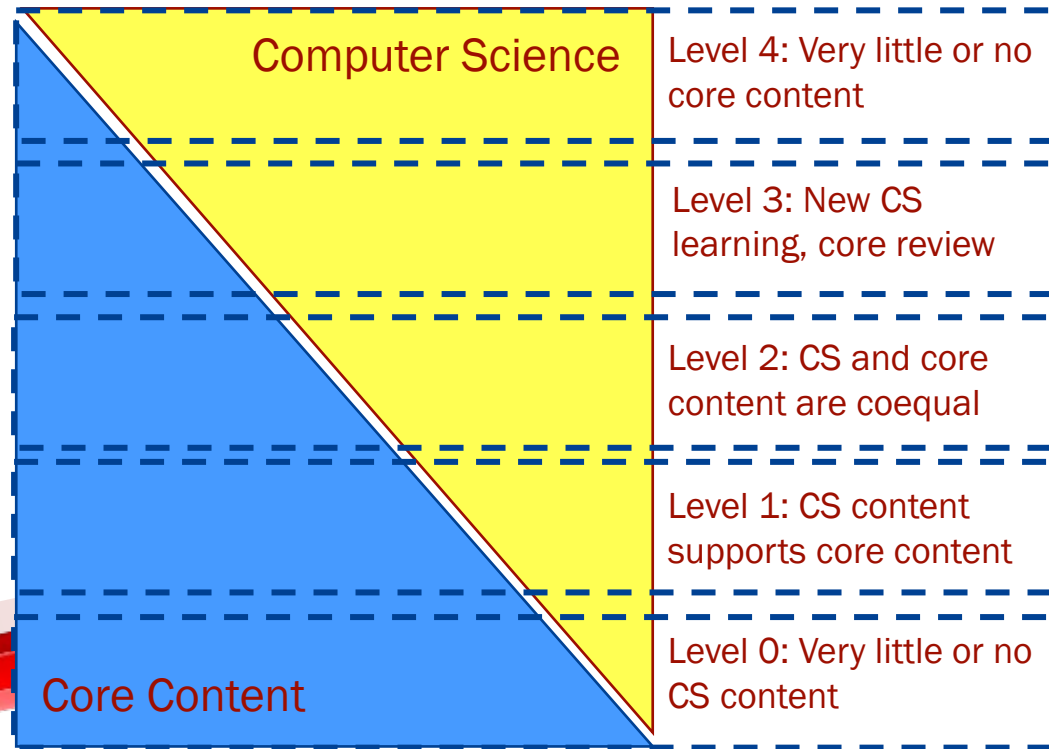
Level 0: Very little or no CS content

Core Content

Level 3

- At this level, the instructional goal of the lesson includes new CS learning and a review or application of existing core content area learning. For example, students write a simple program to accomplish a task that is familiar (e.g. the Scratch Sprite says something students know how to spell)

Adapted from Code VA's *Integration Planning Guide*

Computer Science

Level 4: Very little or no core content

Level 3: New CS learning, core review

Level 2: CS and core content are coequal

Level 1: CS content supports core content

Core Content

Level 0: Very little or no CS content

Level 4

- At this level, the instructional goal of the lesson includes mostly new CS learning. No new core content area knowledge and skills are taught.

Adapted from Code VA's *Integration Planning Guide*
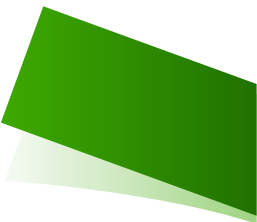
Integrating means that "knowledge is meaningfully related and connects in such a way that it is relevant to other areas of learning as well as real life." (Morris, 2003)

"Integration can be efficient and fun!"

Morris, R.C. (2003). A guide to curricular integration. *Kappa Delta Pi Record 39* (4). 10.1080/00228958.2003.10516399

2. Integration using SOL content and skills

The attached PDF provides a background and example on using the CS SOL curriculum framework to help guide your integration.

ARCS CSLI Content 2.pdf **(https://canvas.odu.edu/courses/185317/files/44846317/download?wrap=1)**
⬇ **(https://canvas.odu.edu/courses/185317/files/44846317/download?download_frd=1)** Ⓣ

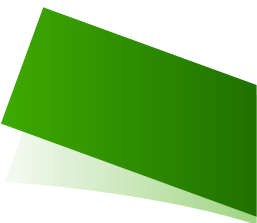ARCS Microcredential: Lesson Integration

An integration example
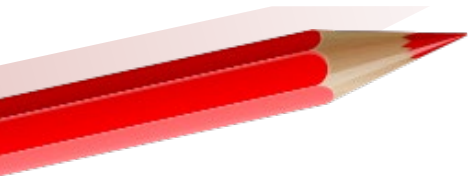
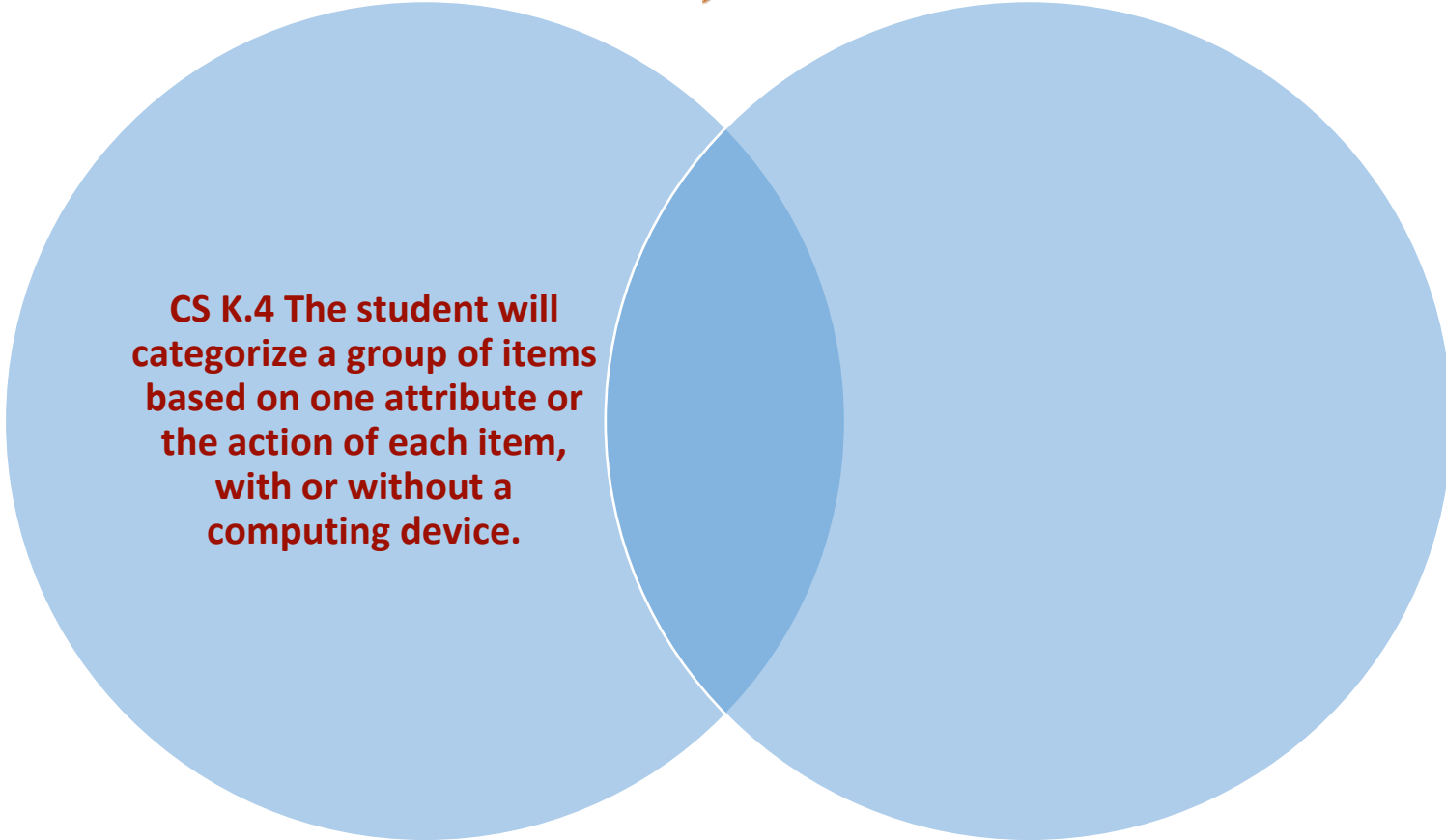This presentation includes steps for integrating using common SOL concepts and skills

An integrated lesson links two or more subject areas

Strategy 1. Look for overlap in content and skill

An integrated lesson links two or more subject areas

CS K.4 The student will categorize a group of items based on one attribute or the action of each item, with or without a computing device.

An integrated lesson links two or more subject areas

CS K.4 The student will categorize a group of items based on one attribute or the action of each item, with or without a computing device.

Mathematics: K.9 The student will compare two objects or events, using direct comparisons, according to one or more of the following attributes: length (longer, shorter), height (taller, shorter), weight (heavier, lighter), temperature (hotter, colder), volume (more, less), and time (longer, shorter).
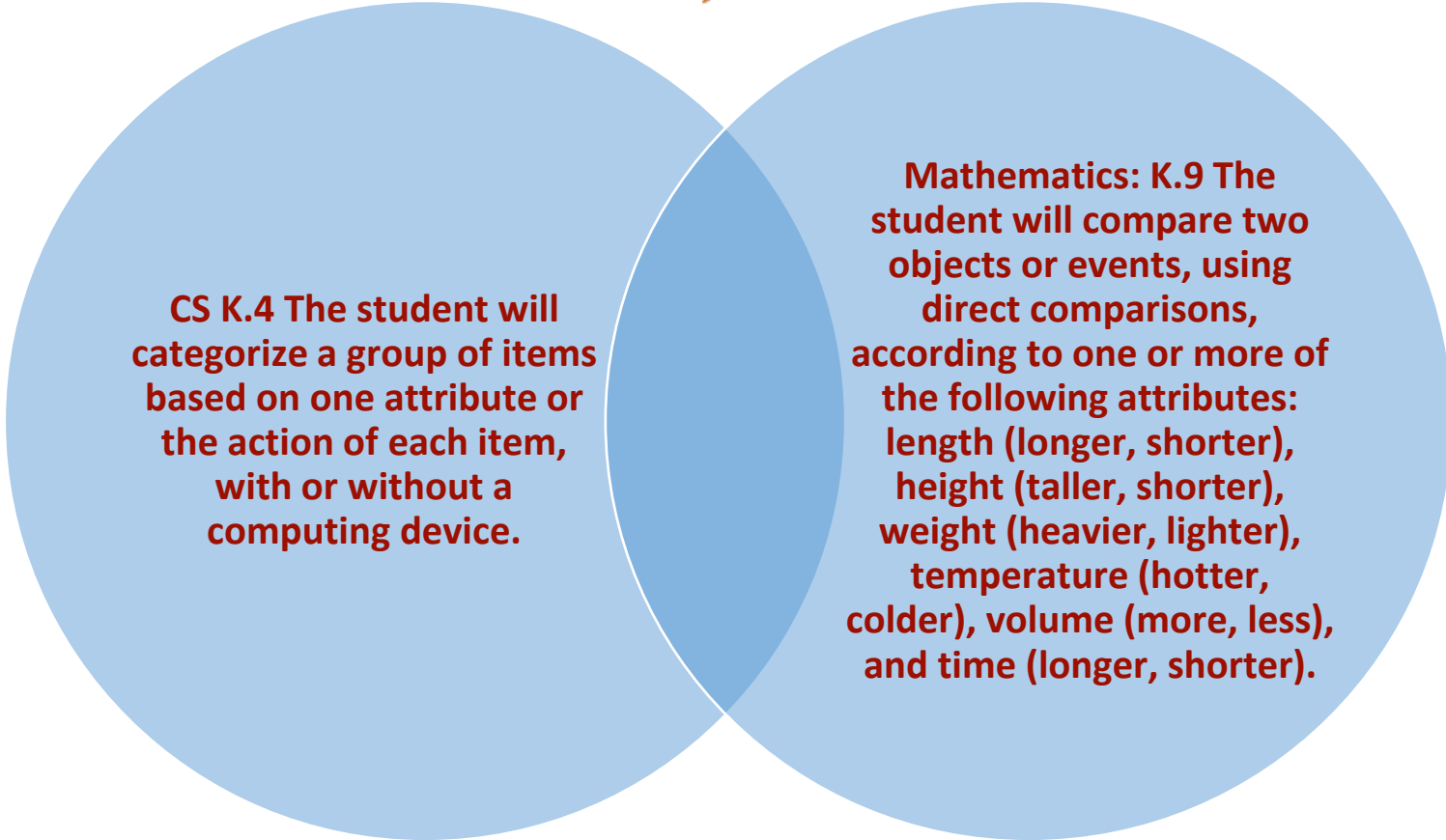
An integrated lesson links two or more subject areas

CS K.4 The student will categorize a group of items based on one attribute or the action of each item, with or without a computing device.

?

Mathematics: K.9 The student will compare two objects or events, using direct comparisons, according to one or more of the following attributes: length (longer, shorter), height (taller, shorter), weight (heavier, lighter), temperature (hotter, colder), volume (more, less), and time (longer, shorter).

What do these standards have in common?

An integrated lesson links two or more subject areas

CS K.4 The student will categorize a group of items based on one attribute or the action of each item, with or without a computing device.
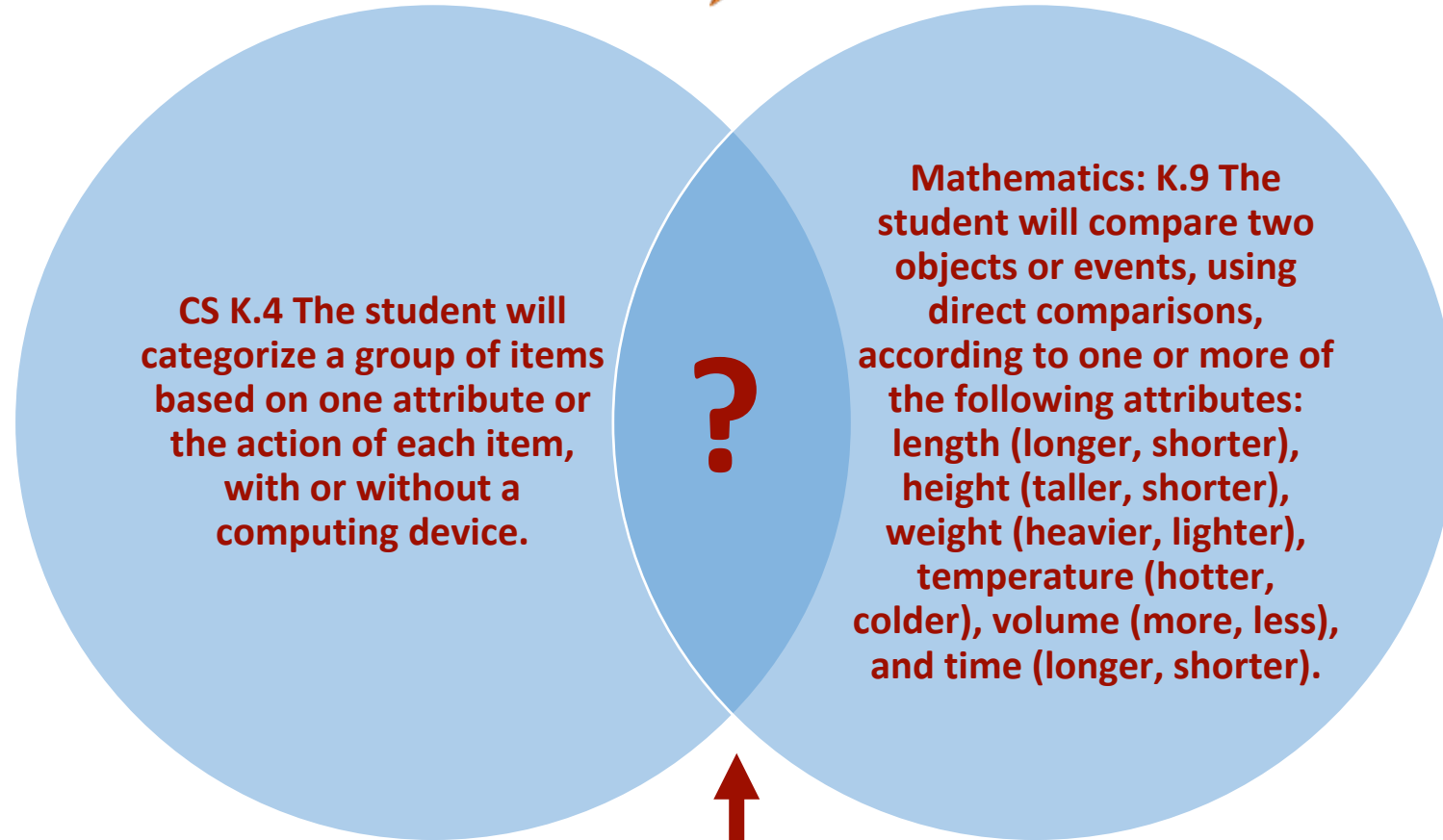
?

Mathematics: K.9 The student will compare two objects or events, using direct comparisons, according to one or more of the following attributes: length (longer, shorter), height (taller, shorter), weight (heavier, lighter), temperature (hotter, colder), volume (more, less), and time (longer, shorter).
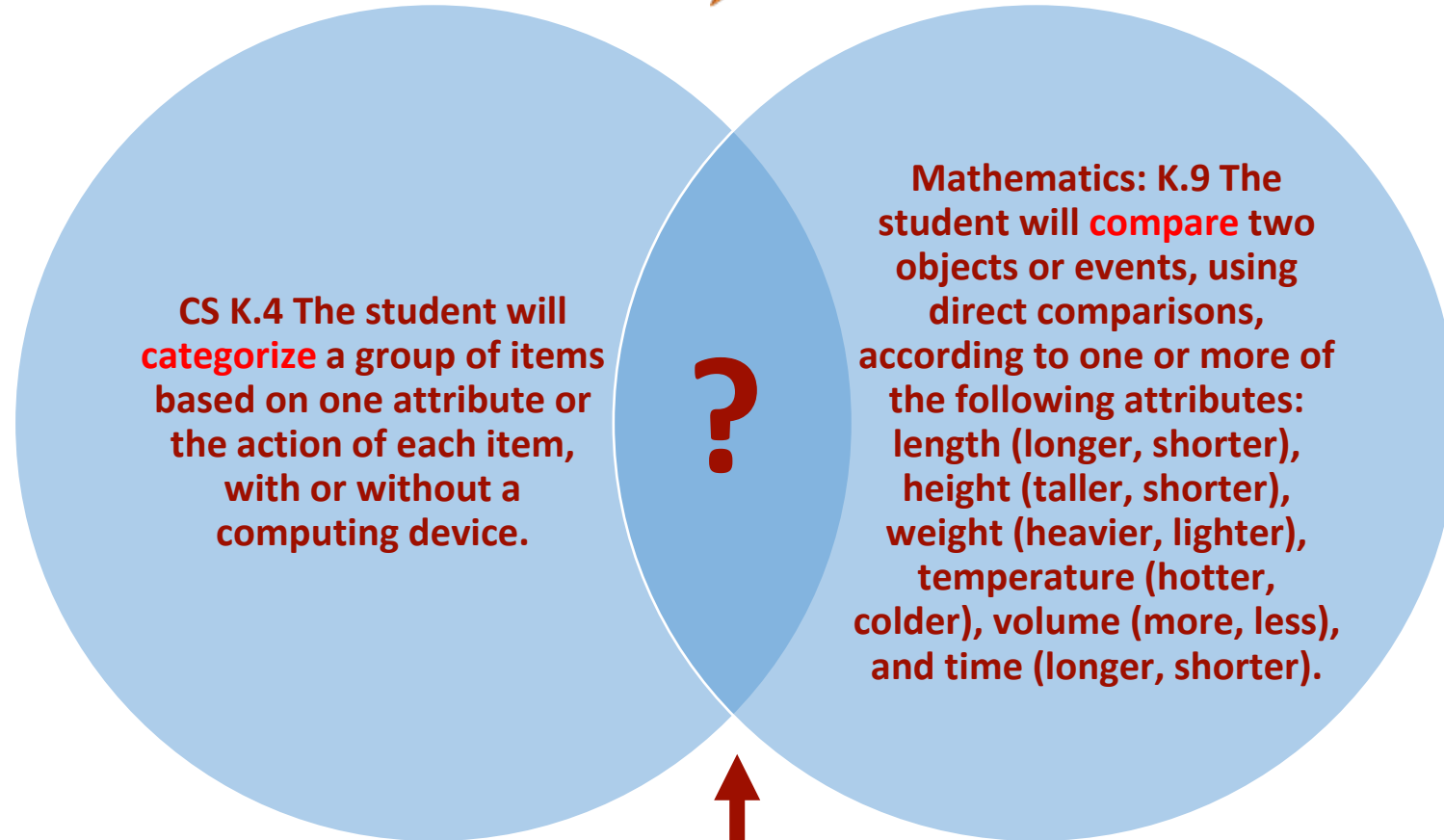
What do these standards have in common?

Skills: compare, categorize
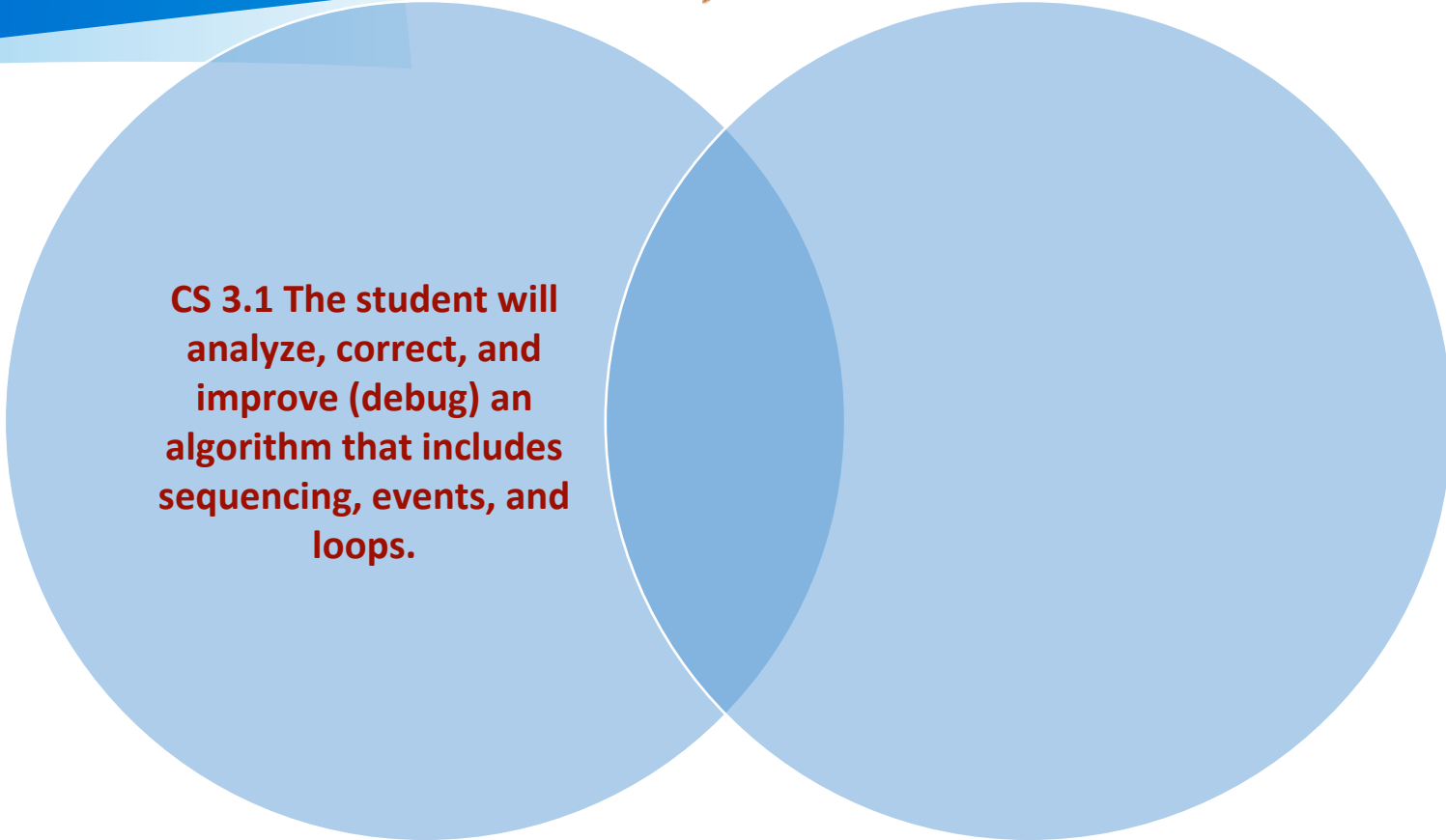
An integrated lesson links two or more subject areas

CS K.4 The student will categorize a group of items based on one **attribute** or the action of each item, with or without a computing device.

?

Mathematics: K.9 The student will compare two objects or events, using direct comparisons, according to one or more of the following **attributes**: length (longer, shorter), height (taller, shorter), weight (heavier, lighter), temperature (hotter, colder), volume (more, less), and time (longer, shorter).
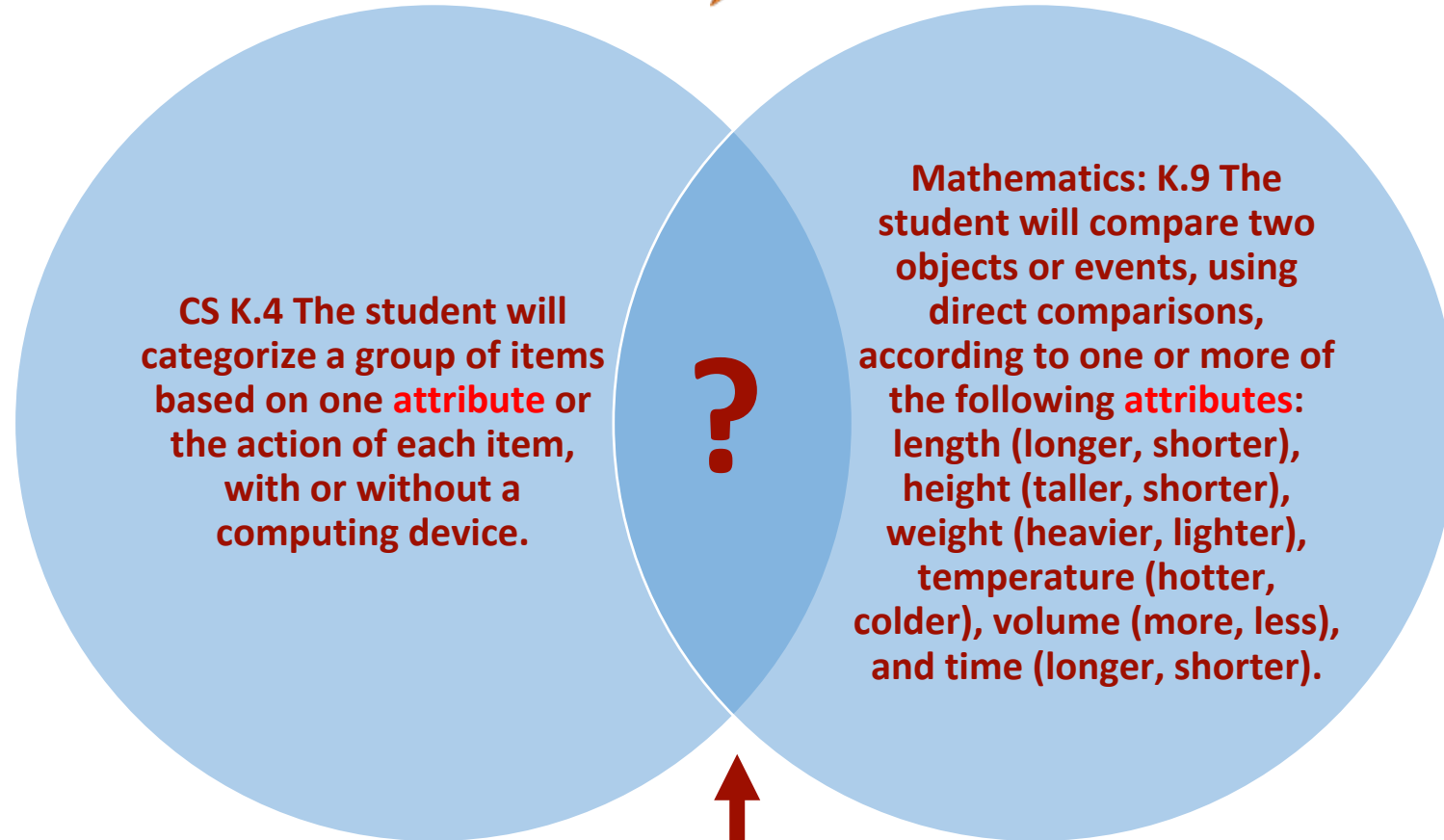
What do these standards have in common?

Skills: compare, categorize

Content: attributes

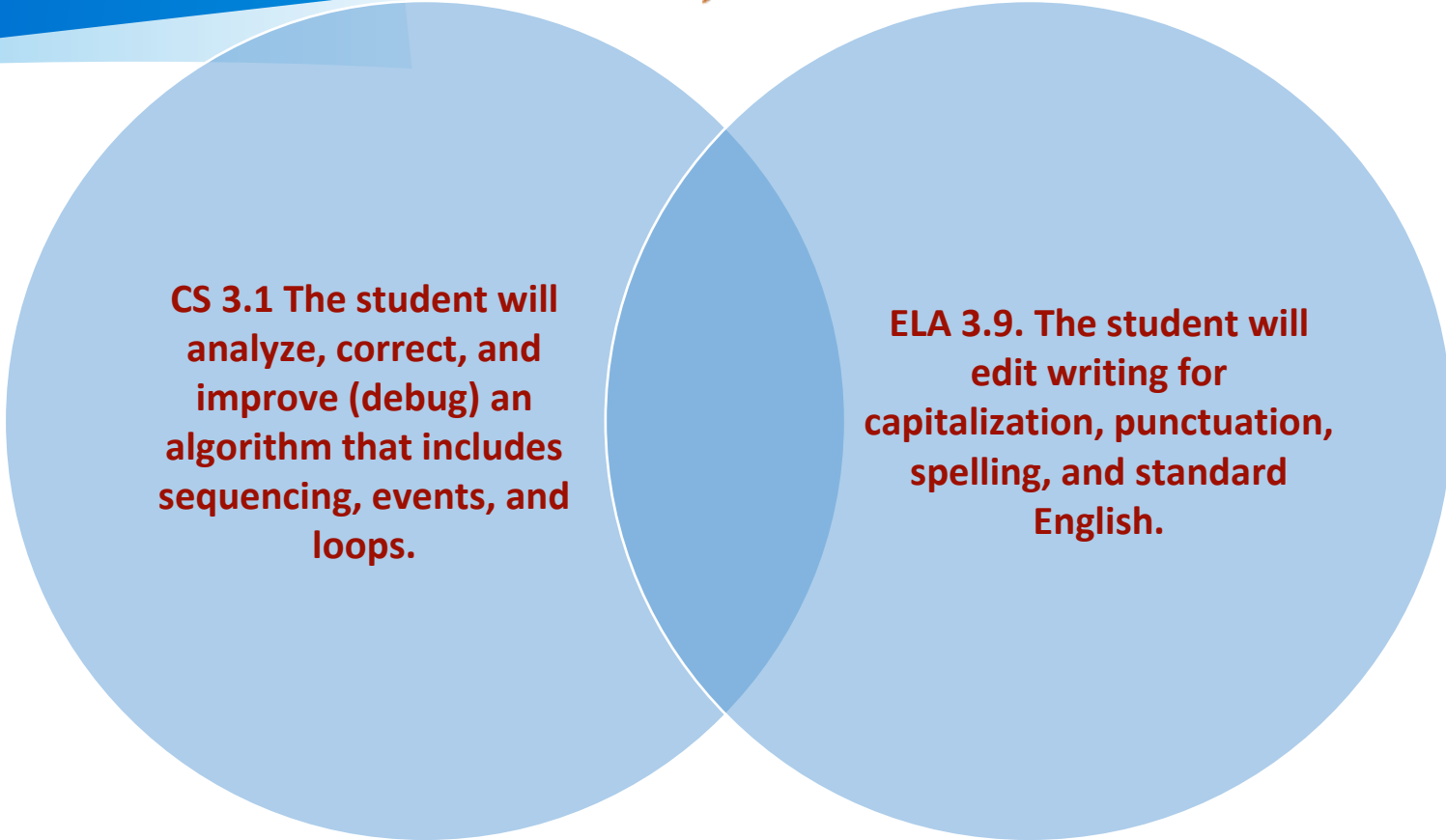CS 3.1 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, and loops.

Here is another example…

CS 3.1 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, and loops.

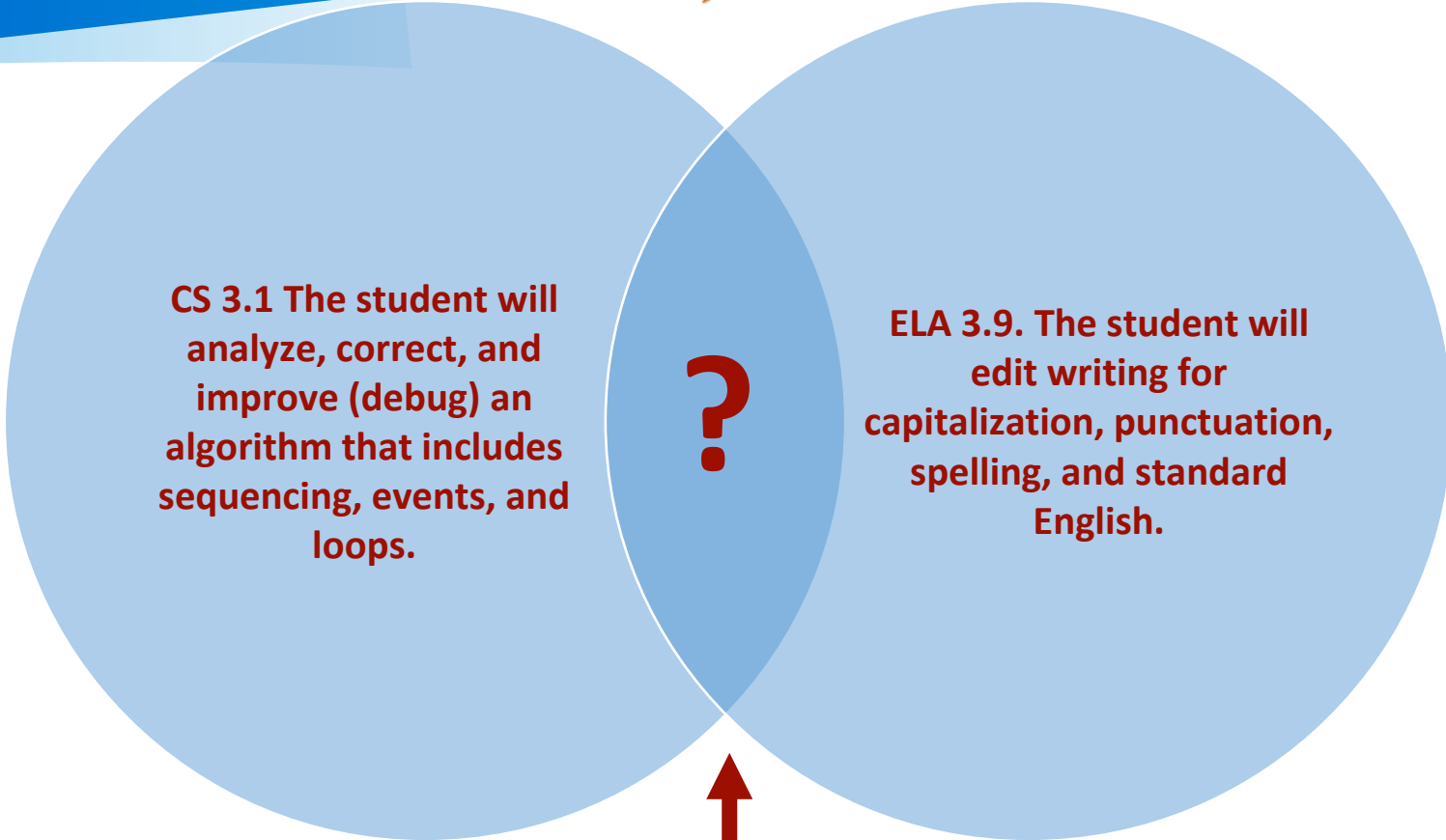ELA 3.9. The student will edit writing for capitalization, punctuation, spelling, and standard English.

Here is another example…

CS 3.1 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, and loops.

?

ELA 3.9. The student will edit writing for capitalization, punctuation, spelling, and standard English.

What do these standards have in common?
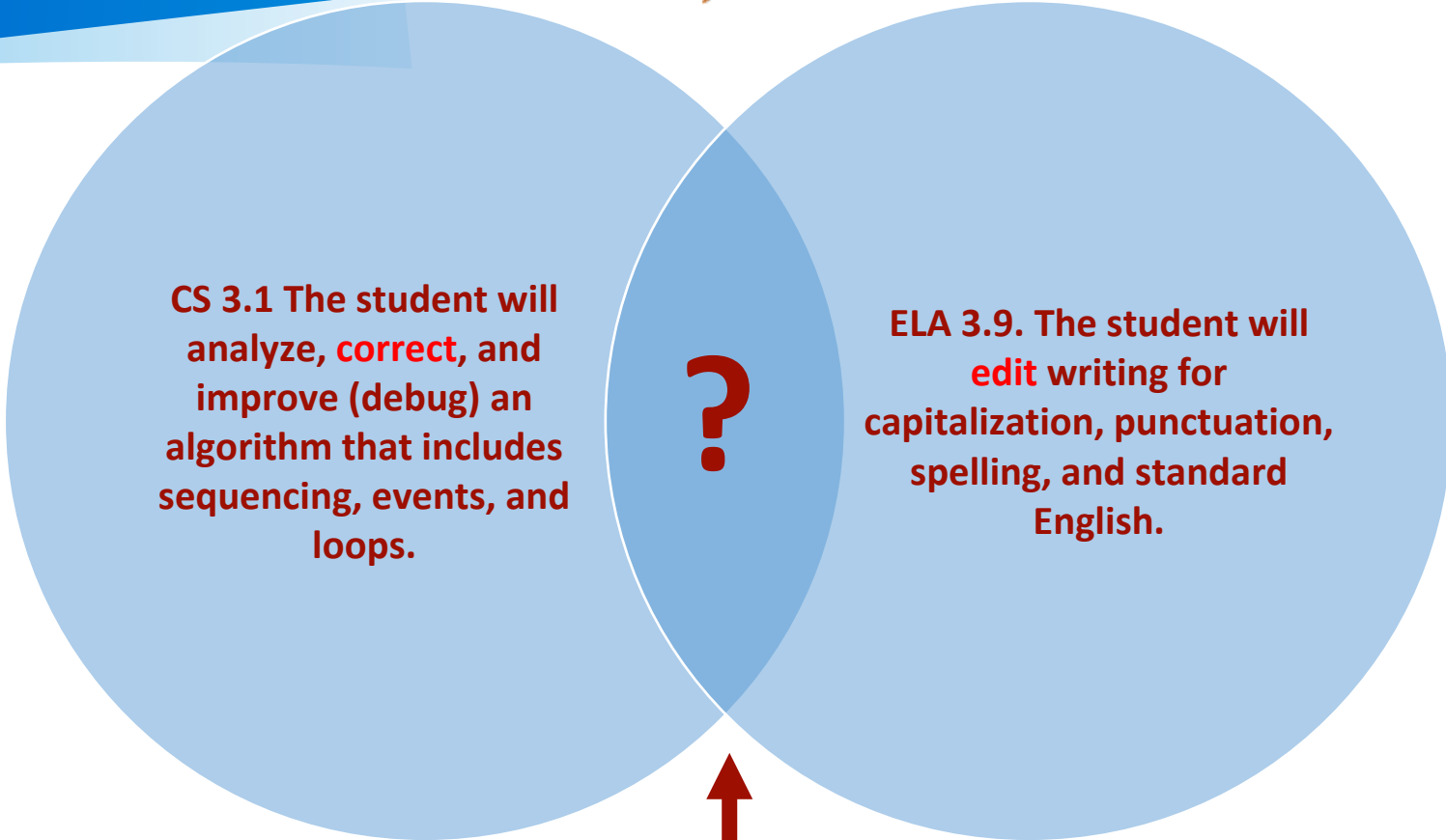
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?

ELA 3.9. The student will edit writing for capitalization, punctuation, spelling, and standard English.

What do these standards have in common?

Skills: correct, edit

CS 3.1 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, and loops.

?

ELA 3.9. The student will edit writing for capitalization, punctuation, spelling, and standard English.
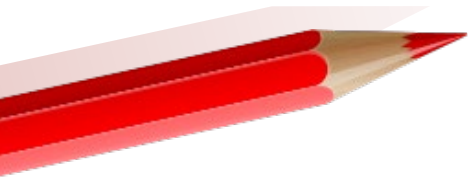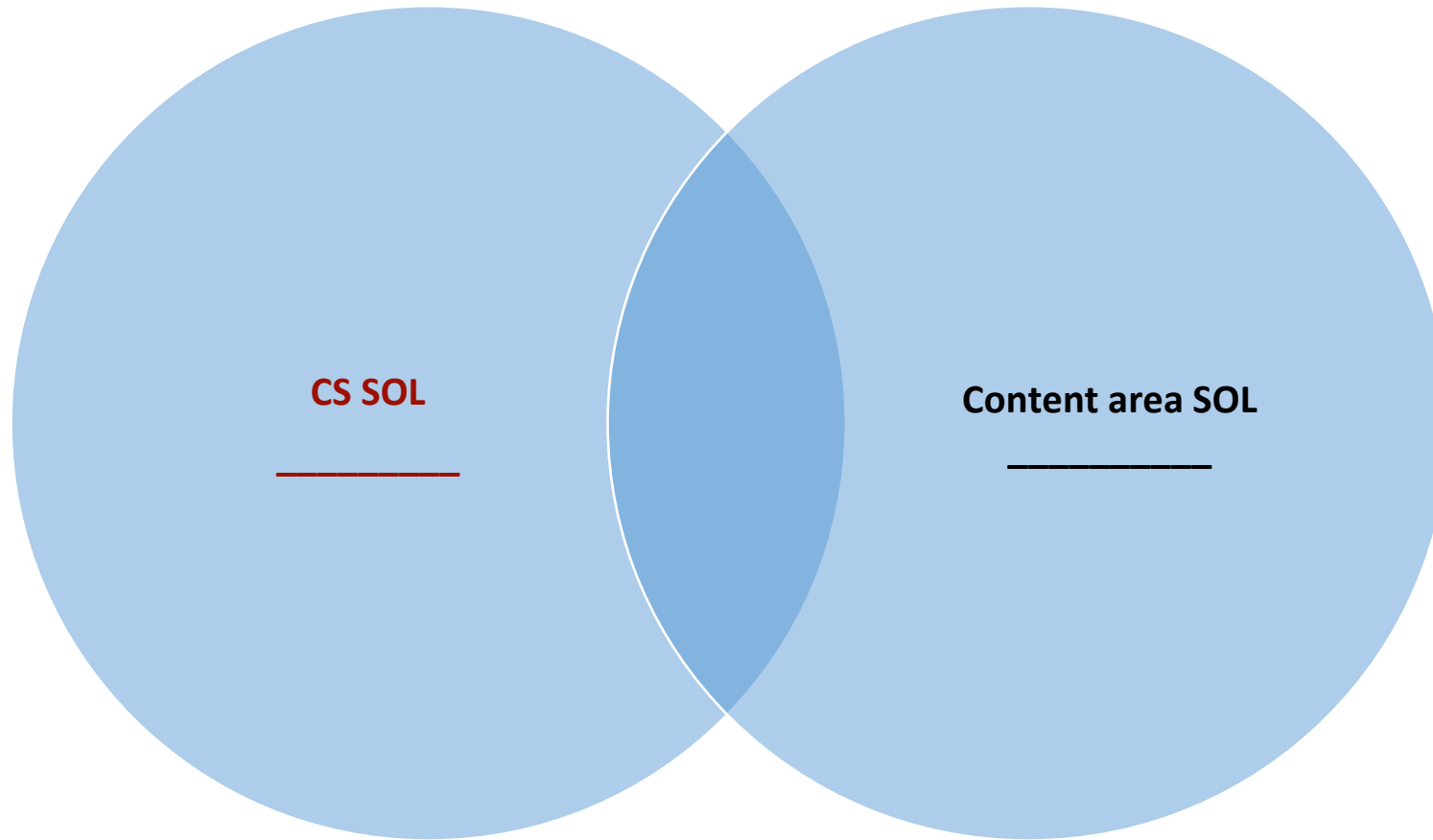
What do these standards have in common?

Skills: correct, edit

Content: algorithm, writing

Which CS SOL and content area SOL are aligned for you?

CS SOL

_____

Content area SOL

_____

Skills: _____

Content: _____

3. Integration using a common theme

View the attached PDF which provides an overview and example for using a common theme to guide integration. Use the Venn Diagram template (Word and PDF format provided, use the format that works best for you) to complete the Venn Diagram assignment that immediately follows this page.

ARCS CSLI Content 3.pdf (https://canvas.odu.edu/courses/185317/files/44846316/download?wrap=1) ↓ (https://canvas.odu.edu/courses/185317/files/44846316/download?download_frd=1)

CS Integration Venn Diagram Template.docx (https://canvas.odu.edu/courses/185317/files/44846554?wrap=1) ↓ (https://canvas.odu.edu/courses/185317/files/44846554/download?download_frd=1)

CS Integration Venn Diagram Template.pdf (https://canvas.odu.edu/courses/185317/files/44846553?wrap=1) ↓ (https://canvas.odu.edu/courses/185317/files/44846553/download?download_frd=1)

ARCS Microcredential: Lesson Integration

Another integration example

This presentation includes steps for integrating using a common theme.
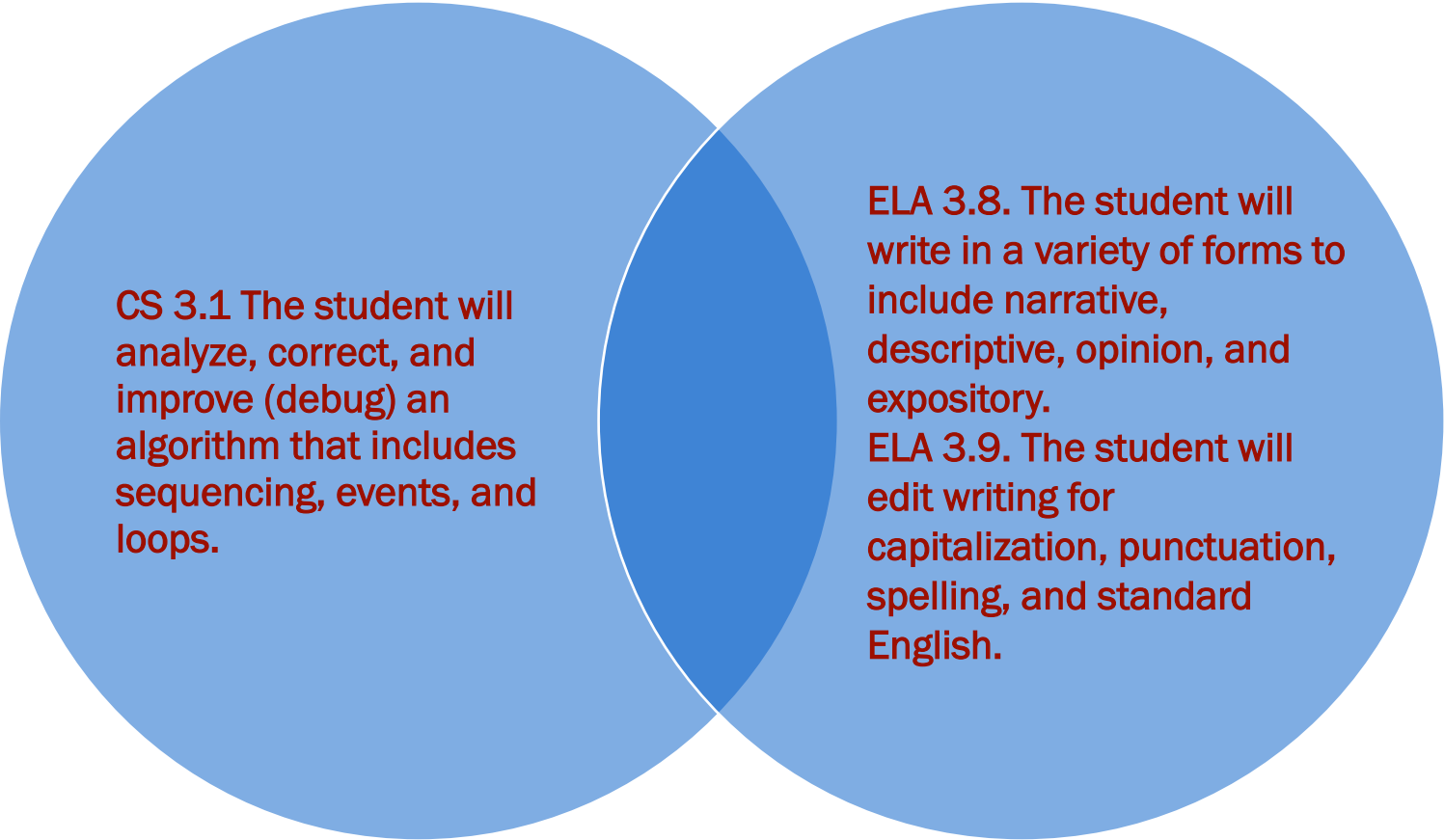
A theme-based instructional goal can be used for integration

**Strategy 2.
Generate a theme**

This CS standard can be linked with an additional ELA standard

CS 3.1 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, and loops.

ELA 3.8. The student will write in a variety of forms to include narrative, descriptive, opinion, and expository.
ELA 3.9. The student will edit writing for capitalization, punctuation, spelling, and standard English.

This CS standard can be linked with an additional ELA standard

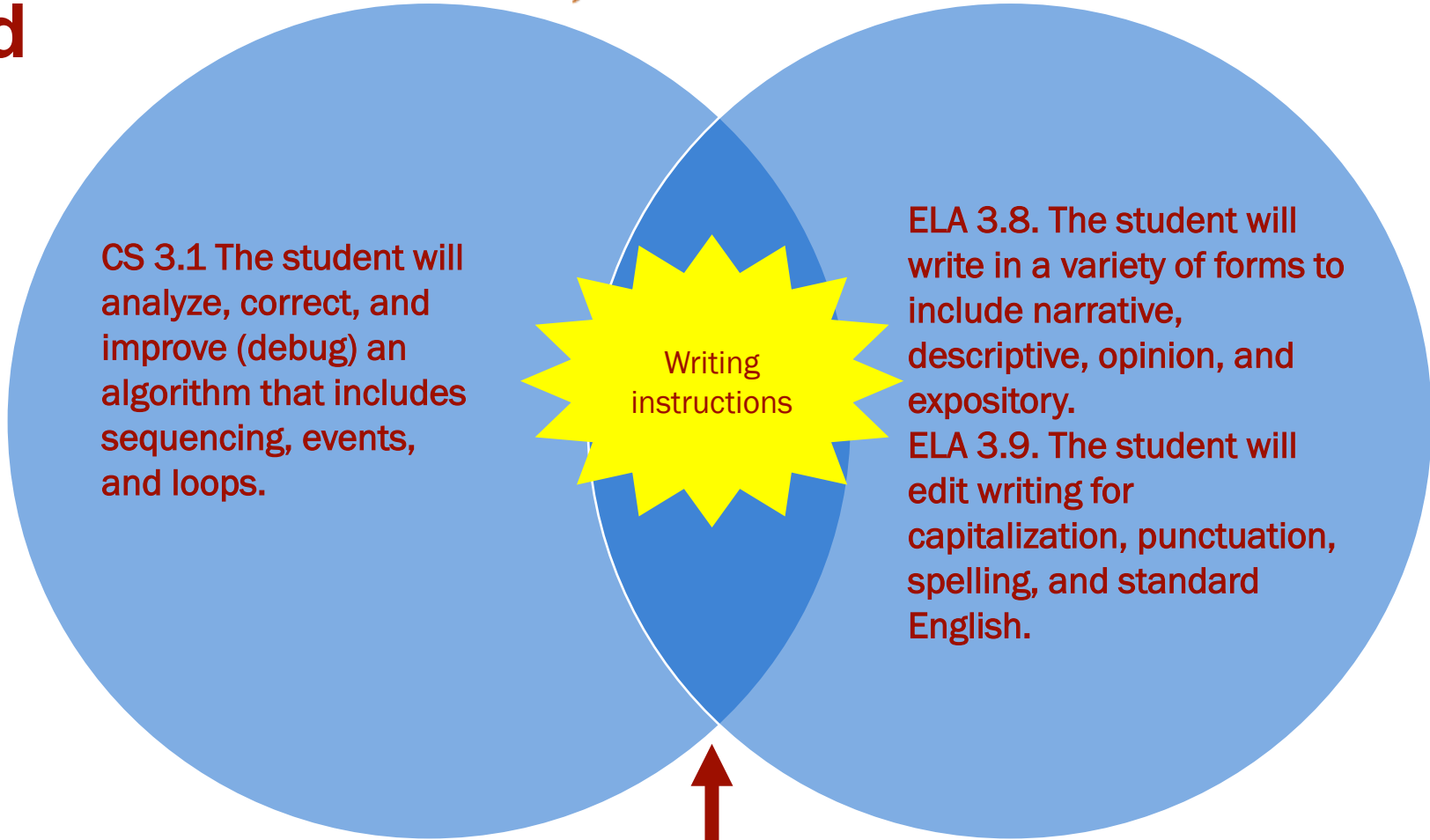CS 3.1 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, and loops.

Writing instructions

ELA 3.8. The student will write in a variety of forms to include narrative, descriptive, opinion, and expository.
ELA 3.9. The student will edit writing for capitalization, punctuation, spelling, and standard English.

Clear instructions are needed in computer programs, recipes, science experiments, etc.

What theme can you use to meet an instructional goal and connect a CS SOL and a content area SOL?
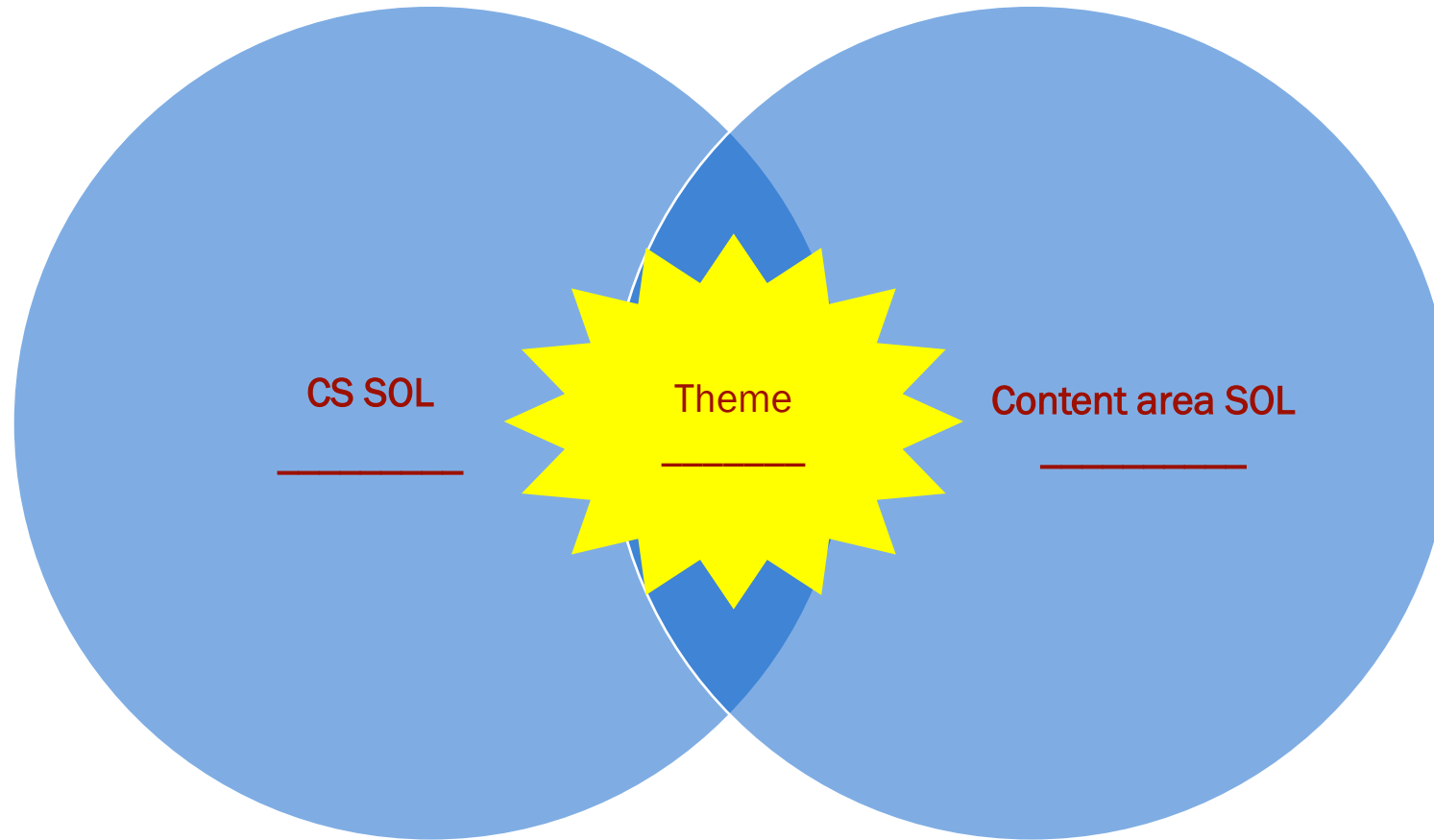
CS SOL

_____

Theme

_____

Content area SOL

_____

Resources to guide the selection of standards

Virginia CS related curriculum framework documents:

Computer Science

Computer Science Cross-Curricular Alignment

Digital Learning

Virginia core content curriculum framework documents:
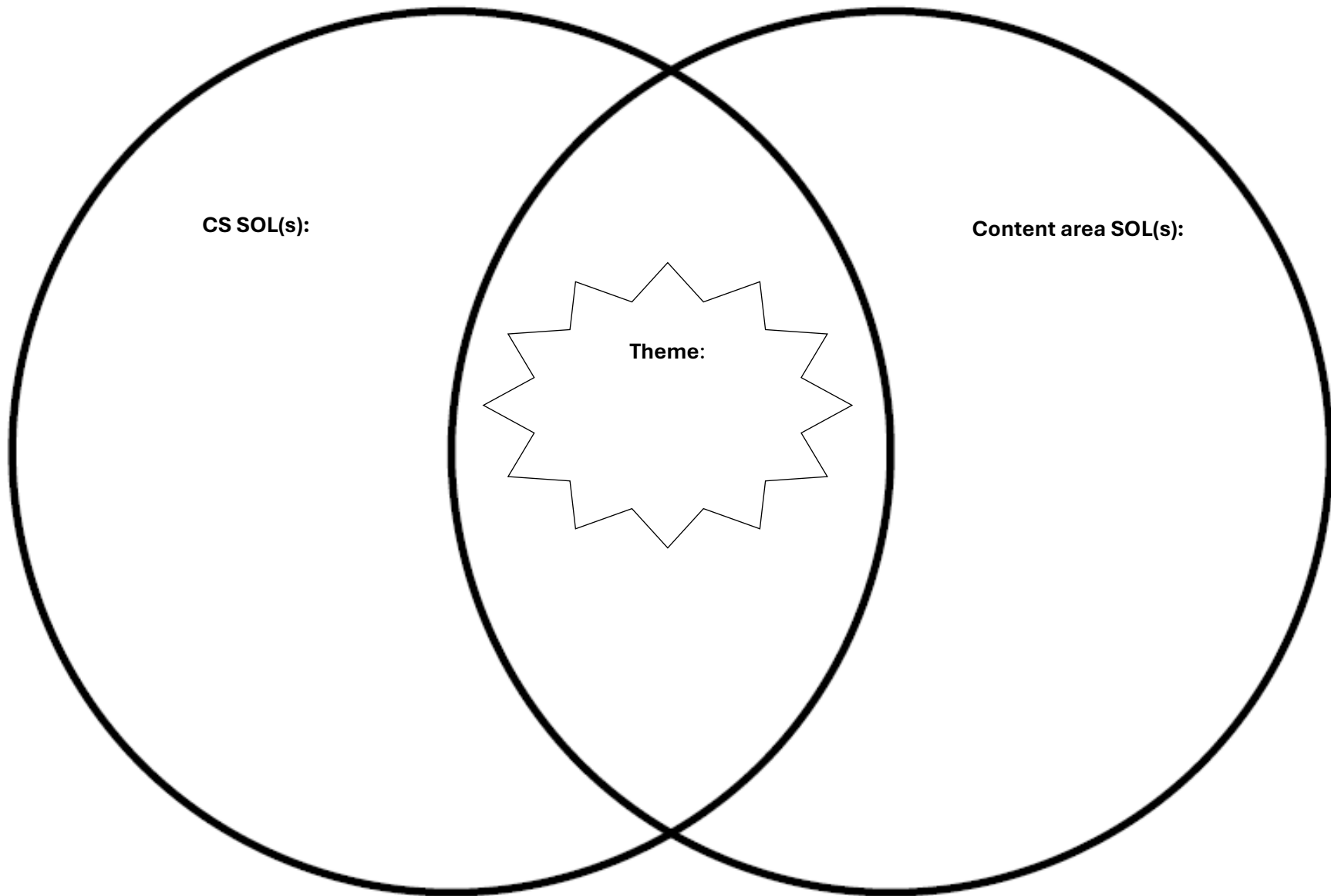
English

Mathematics

Social Studies

Integrated curriculum:

ASCD Integrated curriculum

Venn Diagram: Plan Your Integration Strategy

Create a diagram using the template below (or you can create your own Venn Diagram) that illustrates your thoughts about integrating computer science standards into your core content area(s).

CS SOL(s):

Content area SOL(s):

Theme:

CS Integration Venn Diagram

Published | Assign To | Edit | ⋮

This self-reflection assignment/exercise should be completed after you have viewed the first three content documents (PDFS) for this course.

Using the template included on the previous page (or you can create your own Venn diagram), upload a diagram that shows an example of your thoughts about integrating CS into your core content area(s).

[(https://www.blackboard.odu.edu/webapps/blackboard/content/listContentEditable.jsp? content_id=_9903104_1&course_id=_390969_1&VxJw3wfC56=1646010979&Kq3cZcYS15=966c2653c06f4ea8aafdbdd43f168dd1&3cCnGYSz89=yl1VUg2V61Lxev5gr](https://www.blackboard.odu.edu/webapps/blackboard/content/listContentEditable.jsp?)

Points	10
Submitting	a text entry box or a file upload
Allowed Attempts	1

Due	For	Available from	Until
-	Everyone	-	-

+ Rubric

ARCS Microcredential: Lesson Integration

Using the 5E Model

Using the Essential Knowledge and Skills,
Essential Questions, Objectives, and Vocabulary from the
CS Curriculum Framework will help you develop your
integrated lesson plan.

This information is also incorporated into the
Course Materials for the four computer science content
microcredential courses you will complete in this stack.

The work product for this microcredential is a lesson plan, a template for which you can download and modify.

ARCS Integrated Lesson Plan Template

Lesson Title:	Duration:
CS Standard:	Content area standard:

Essential Question(s):

Student Objectives: I can ...

Vocabulary:

Differentiation strategies:

Resources:

Engage:	
Explore:	
Explain:	
Elaborate:	
Evaluate:	

We are using the 5E format:

Engage: How will the lesson capture students' interest?

Explore: What are the activities students will do? What are the big ideas and questions students will explore?

Explain: How can students be aided in connecting their exploration to the target concept(s)?

Elaborate: How can the knowledge be applied? What vocabulary will be introduced?
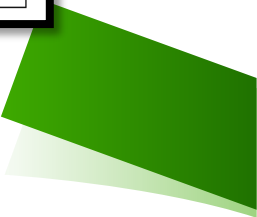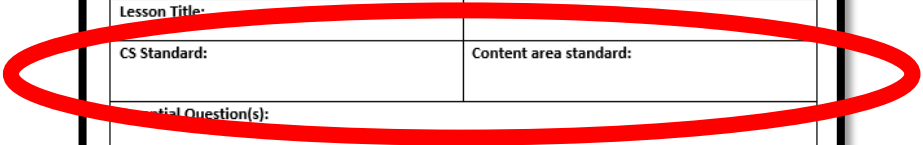
Locate the CS & content area standards in the curriculum framework

CS K.4 The student will categorize a group of items based on one attribute or the action of each item, with or without a computing device.

Mathematics: K.9 The student will compare two objects or events, using direct comparisons, according to one or more of the following attributes: length (longer, shorter), height (taller, shorter), weight (heavier, lighter), temperature (hotter, colder), volume (more, less), and time (longer, shorter).

ARCS Integrated Lesson Plan Template

Lesson Title:	
CS Standard:	Content area standard:

Essential Question(s):

Student Objectives: I can ...
Vocabulary:
Differentiation strategies:
Resources:

Engage:	
Explore:	
Explain:	
Elaborate:	
Evaluate:	

The curriculum framework documents can provide guidance on your essential question(s)

ARCS Integrated Lesson Plan Template

Lesson Title:	Duration:
CS Standard:	Content area standard:
Essential Question(s):	
Student Objectives: I can ...	
Vocabulary:	
Differentiation strategies:	
Resources:	
Engage:	
Explore:	
Explain:	
Elaborate:	
Evaluate:	

CS K.4

Essential Questions

Students should *investigate* these concepts:

- How do people describe different cars/animals/movements/etc.?
- How do people organize different objects into categories?
- How would you compare and contrast two basic actions (taking a step vs. turning your head, for example)?

Math K.9

Essential Knowledge and Skills

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Compare and describe lengths of two objects as longer or shorter, using direct comparison (e.g., the bus is longer than the car).
- Compare and describe heights of two objects (as taller or shorter), using direct comparison.
- Compare and describe weights of two objects (as heavier or lighter), using direct comparison.
- Compare and describe temperatures of two objects or environment (as hotter or colder), using direct comparison.
- Compare and describe volumes of two containers (as more or less), using direct comparison.
- Compare and describe the amount of time spent on two events (as longer or shorter), using direct comparison.

The curriculum framework documents can provide guidance on your essential question(s)

Math K.9

CS K.4

ARCS Integrated Lesson Plan Template

Lesson Title:	Duration:
CS Standard:	Content area standard:
Essential Question(s):	
Objectives: I can …	
Vocabulary:	
Differentiation strategies:	
Resources:	
Engage:	
Explore:	
Explain:	
Elaborate:	
Evaluate:	

Essential Questions

Students should *investigate* these concepts:

- How do people describe different cars/animals/movements/etc.?
- How do people organize different objects into categories?
- How would you compare and contrast two basic actions (taking a step vs. turning your head, for example)?

How can we compare items and actions?

Essential Knowledge and Skills

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Compare and describe lengths of two objects as longer or shorter, using direct comparison (e.g., the bus is longer than the car).
- Compare and describe heights of two objects (as taller or shorter), using direct comparison.
- Compare and describe weights of two objects (as heavier or lighter), using direct comparison.
- Compare and describe temperatures of two objects or environment (as hotter or colder), using direct comparison.
- Compare and describe volumes of two containers (as more or less), using direct comparison.
- Compare and describe the amount of time spent on two events (as longer or shorter), using direct comparison.

The curriculum framework documents can provide guidance on your lesson's objectives

ARCS Integrated Lesson Plan Template

Lesson Title:	Duration:
CS Standard:	Content area standard:

Essential Question(s):

Student Objectives: I can …

Vocabulary:

Differentiation strategies:

Resources:

Engage:	
Explore:	
Explain:	
Elaborate:	
Evaluate:	

Student objectives:

I can say how two objects are different from one another.

I can compare two actions are different from one another.

The curriculum framework documents can provide guidance on your vocabulary

ARCS Integrated Lesson Plan Template

Lesson Title:	Duration:
CS Standard:	Content area standard:

Essential Question(s):

Student Objectives: I can

Vocabulary:

Differentiation strategies:

Resources:

Engage:

Explore:

Explain:

Elaborate:

Evaluate:

CS Vocabulary:

Pattern Matching (deciding if two things are the same or not)
Program (steps a computer uses to do a task or solve a problem)

Math Vocabulary:

Length, weight, temperature, volume

Resources to guide the selection of standards

Virginia CS related curriculum framework documents:

[Computer Science](#)

[Computer Science Cross-Curricular Alignment](#)

[Digital Learning](#)

Virginia core content curriculum framework documents:

[English](#)

[Mathematics](#)

[Social Studies](#)

Integrated curriculum:

[ASCD Integrated curriculum](#)

Lesson Plan Brainstorm

Fill in the icons with a lesson component ideas

Engage: How will I capture student's interest?

Explore: Describe hands-on / minds-on activities students will be doing. List "Big Idea" questions.

Explain: What techniques can I use to help students connect the exploration to the concept?

Elaborate: What vocabulary will be introduced? How will the knowledge be applied to daily life?

Evaluate: How will students demonstrate that they have achieved the lesson objective?
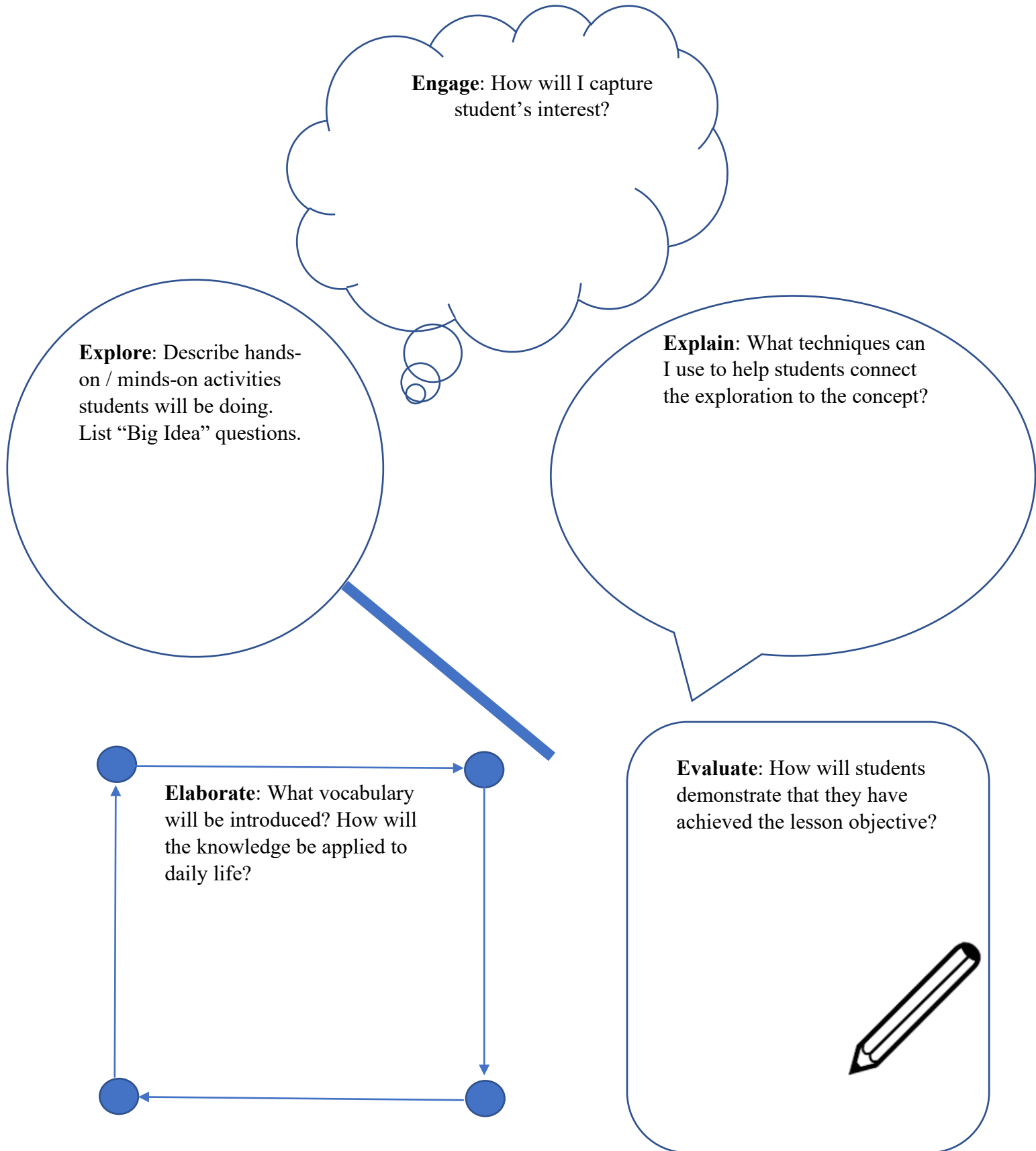
ARCS Microcredential: Lesson Integration

5E Model Components

Which type of integration are you planning to use?

You could use an interdisciplinary approach using common concepts and skills:
compare objects and actions by their attributes

CS K.4

Math K.9

Comparing via attributes

Matching

Classifying

Communicating through math

Which type of integration are you planning to use?

CS K.4

Comparing via attributes

Matching

Classifying

Communicating through math

Math K.9

Computer Science

Core Content

Level 4: Very little or no core content

Level 3: New CS learning, core review

Level 2: CS and core content are coequal

Level 1: CS content supports core content

Level 0: Very little or no CS content

You could use an interdisciplinary approach using common concepts and skills:
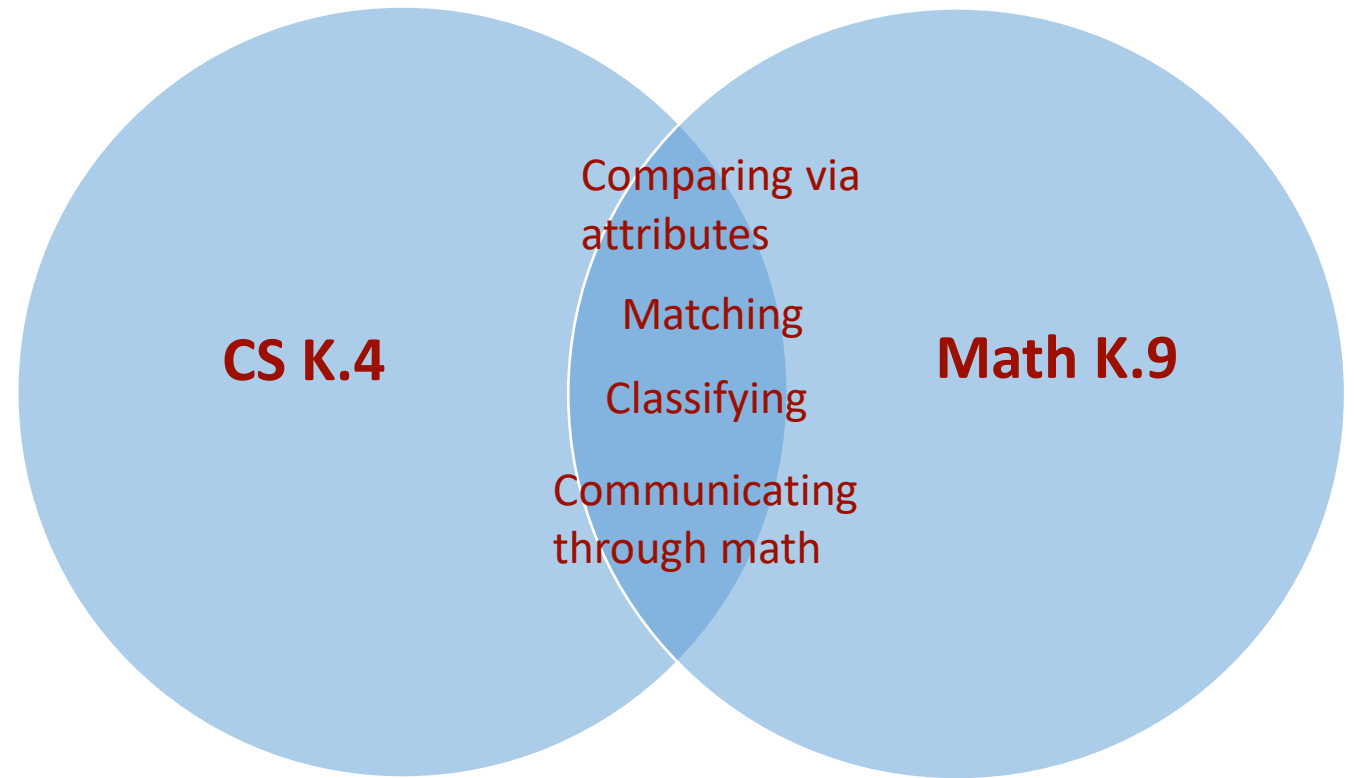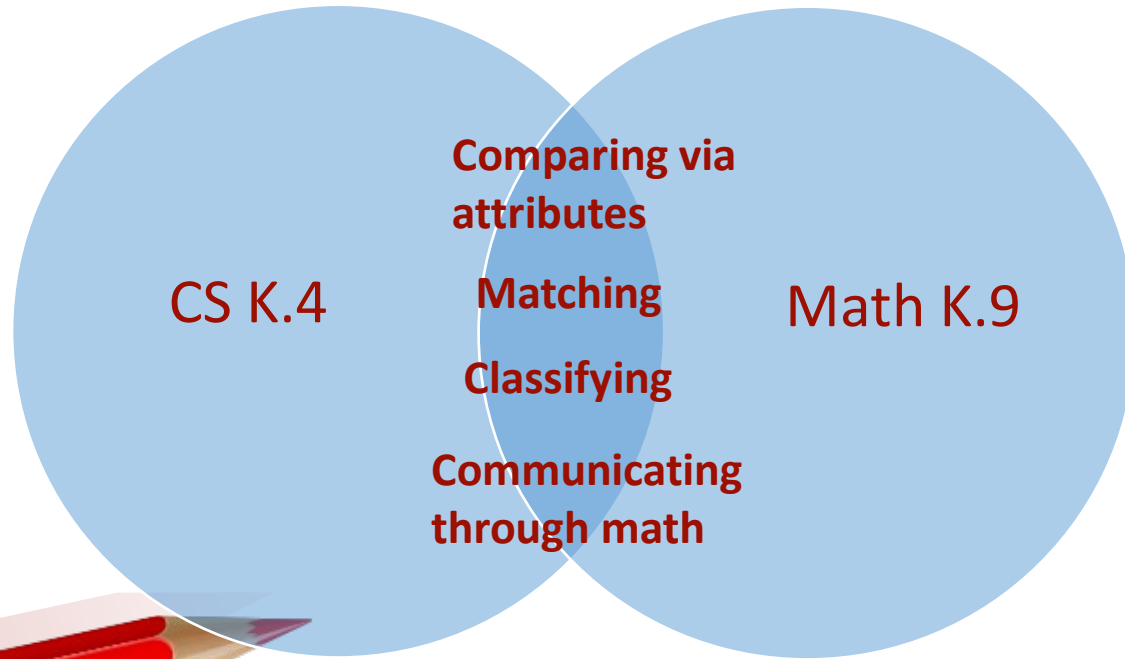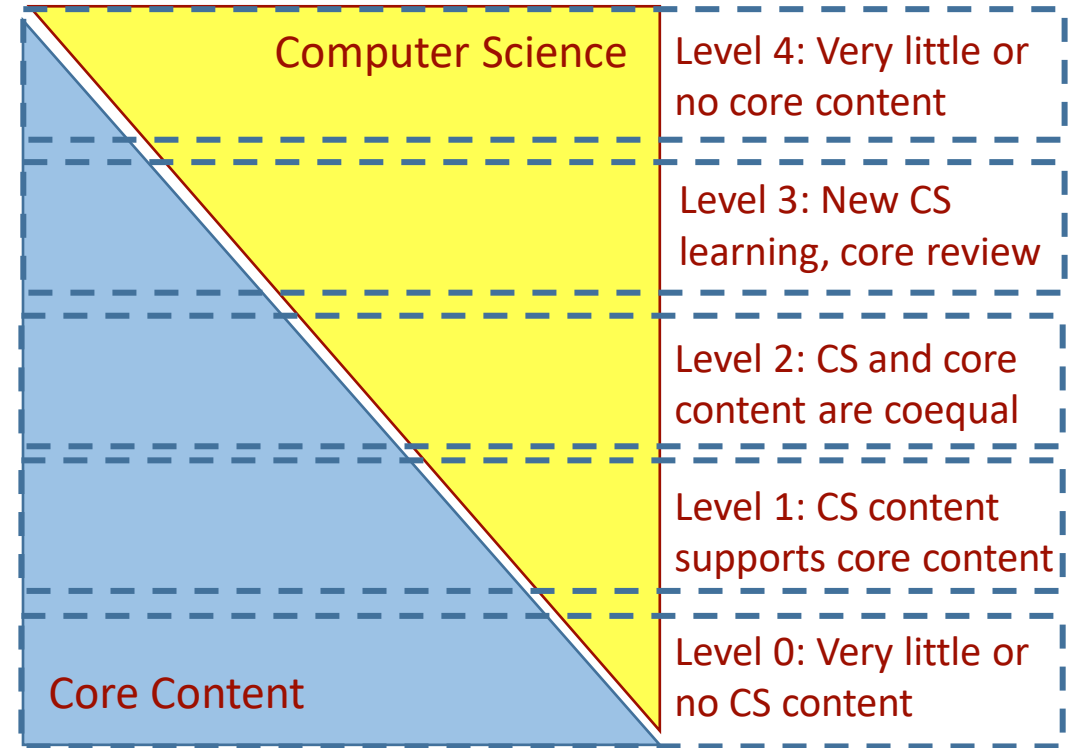**compare objects and actions by their attributes**

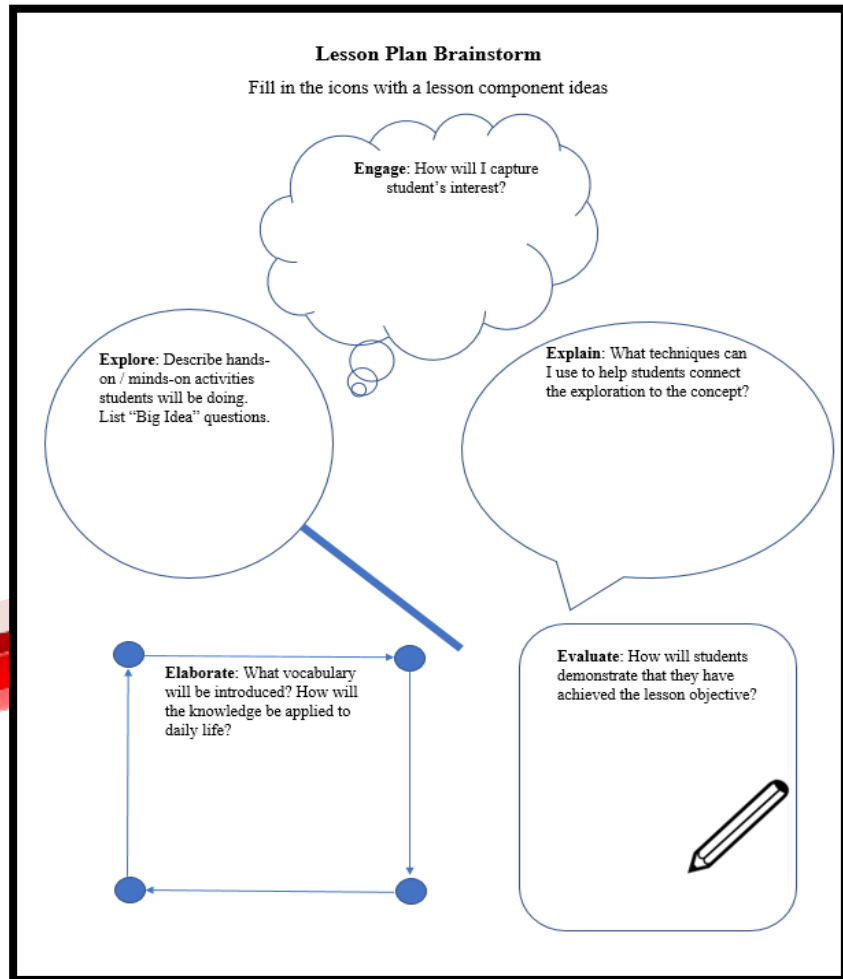**The level will depend on your learners, curriculum, and pacing guide.**

Lesson Plan Brainstorm

Fill in the icons with a lesson component ideas

Engage: How will I capture student's interest?

Explore: Describe hands-on / minds-on activities students will be doing. List "Big Idea" questions.

Explain: What techniques can I use to help students connect the exploration to the concept?

Elaborate: What vocabulary will be introduced? How will the knowledge be applied to daily life?

Evaluate: How will students demonstrate that they have achieved the lesson objective?

Engage (several ideas):
Present measuring tools and novel objects to be measured
Go for a walk around the classroom fast versus slow
Play a matching (memory) game against a computer

Explore:
Allow students time to compare objects or actions using different tools

Explain:
Create a simple class chart or tabletop display of objects
Use digital tools to measure objects or actions

Explain:
Introduce or review mathematics vocabulary (orally)
Introduce CS vocabulary (orally)
Can students think of (or find) computing devices that measure or compare objects?

Evaluate:
Present students with novel actions or objects. Use a picture-based worksheet to circle the attribute, or tool, as appropriate.
Present novel cut out pictures. Students stick pairs of objects and a tool onto a sheet.

Resources to guide the selection of standards

Virginia CS related curriculum framework documents:

Computer Science

Computer Science Cross-Curricular Alignment

Digital Learning

Virginia core content curriculum framework documents:

English

Mathematics

Social Studies

Integrated curriculum:

ASCD Integrated curriculum

ARCS Lesson Plan Template

Lesson Title:	Duration:
CS Standard:	Content area standard (if applicable):

Essential Question(s):

Student Objectives: I can …

Vocabulary:

Differentiation strategies:

Resources:

Engage:	
Explore:	
Explain:	
Elaborate:	
Evaluate:	

Attachments (as needed)

Student materials

ARCS Microcredential Lesson Rubric

Part A. Lesson Plan Format and Instructional Goals

Teacher competency:	Pass
The lesson plan follows the 5E lesson format.	All of the following are present: ☐ The lesson is organized in the 5E format. ☐ All of the E sections are present: Engage, Explore, Explain, Elaborate, and Evaluate. ☐ The topic of the lesson is evident in all of the E sections.
The lesson plan includes instructional goals and objectives, sometimes referred to as Learning Targets.	All of the following are present: ☐ Instructional goals/objectives are clearly labeled. ☐ What the learner will know and be able to do are clearly stated. ☐ The Evaluate section addresses students' acquisition of the instructional goals and objectives.

Part B. SOL Content Selection and Integration

Teacher competency:	Pass
The lesson is designed around a Virginia Computer Science SOL. A content area SOL is optional except in the Lesson Integration Microcredential.	All of the following are present: ☐ The grade level CS SOL is clearly identified. ☐ Key vocabulary terms are presented. ☐ The Engage or Explore portions of the lesson allow students to enact the CS Standard, Skills and Concepts.
**Lesson Integration Microcredential Lesson Plan: The lesson includes a content area SOL as well as a CS SOL.	All of the following are present: ☐ The grade level content area SOL (e.g. math, science) is clearly identified. ☐ Key vocabulary terms for the content area SOL are presented. ☐ Two or more portions of the lesson plan allow students to enact CS and content area Standards, Skills, and Concepts.

Part C. Instructional Delivery

Teacher competency:	Pass
The lesson describes grade level appropriate instructional strategies.	All of the following are present: ☐ For each of the 5E sections, an appropriate instructional strategy is described. ☐ For each of the 5E sections, the lesson plan includes information about anticipated teacher and student behavior. ☐ The instructional strategies allow for the student to demonstrate the actions listed in the SOL (e.g. create, construct).
The lesson includes appropriate materials and technology.	All of the following are present: ☐ Materials (and technology, if needed) are developmentally appropriate. ☐ All necessary materials (and technology, if needed) are clearly listed. ☐ The selected materials (and technology, if needed) enhance learning.

Part D. Teacher reflection

Teacher competency:	Pass
A statement is included in which the teacher reflects on their own areas of professional growth.	All of the following are present: ☐ Reflection offers insight into why the topic(s) and SOL(s) were chosen as the focus of the lesson. ☐ Reflection describes how the teacher drew on their content knowledge to design the lesson. ☐ Reflection describes how teacher drew on their pedagogical knowledge to design the lesson. ☐ Reflection describes how the lesson could be modified to support one or more groups of diverse learners.

ARCS Microcredential Lesson Plan Self-Reflection Instructions

Please submit a statement of self-reflection for the lesson plan assignment for this course. Your self-reflection should be in narrative format and be no longer than 250 words.

There is no template for this part of the assignment, but please ensure that all of the following are present:

- Reflection offers insight into why the topic(s) and SOL(s) were chosen as the focus of the lesson.
- Reflection describes how the teacher drew on their content knowledge to design the lesson.
- Reflection describes how teacher drew on their pedagogical knowledge to design the lesson.
- Reflection describes how the lesson could be modified to support one or more groups of diverse learners.

Lesson Plan Brainstorm

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