



ELPS in Mathematics

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Need / Data

Objectives for Today



- **Content Objective**

- Review the principle components of the secondary mathematics lesson titled "Equivalent Fractions"
- Provide insight on the implementation of ELPS within a core content lesson
- Explore a mathematics lesson which affords multiple opportunities for a student to gain mastery in the essential knowledge and skills while supporting his/her English language development in listening, speaking, reading, and writing

- **Language Objective**

- Identify and discuss the multiple opportunities students have to develop English language within the content
- Write how some of these practices can be implemented in your class



Why is this important?

- State Requirement: Chapter 74.4 requires **all** content teachers to support ELLs' **development of content and language** as they are an integral part of the required curriculum. The ELPS integrate and focus on skills that **support academic and language development** it is the responsibility of every classroom teacher to be familiar with and supportive of the implementation of the **ELPS** (Dec of 2007)
- Without appropriate linguistic support, students may experience difficulty understanding the grade-level English language used during content-based instruction.



Implementing the ELPS in Mathematics

- Model Lesson: “Equivalent Fractions”
- Lesson Format: 5-E Lesson Model
- Focus: Identify support for academic and linguistic needs of ELLs
 - Different types of activities
 - Different types of materials
- Support based on proficiency levels of individual students
 - Use of native language
 - student-generated examples
 - Additional visuals
 - Adapted text



Language Proficiency of Students

- When planning instruction – consider language proficiency of students (TELPAS) by language domain
 - Provide support for student understanding
 - Develop academic language
 - Opportunities to use language in all 4 domains
 - Activities may or may not incorporate all 4 domains



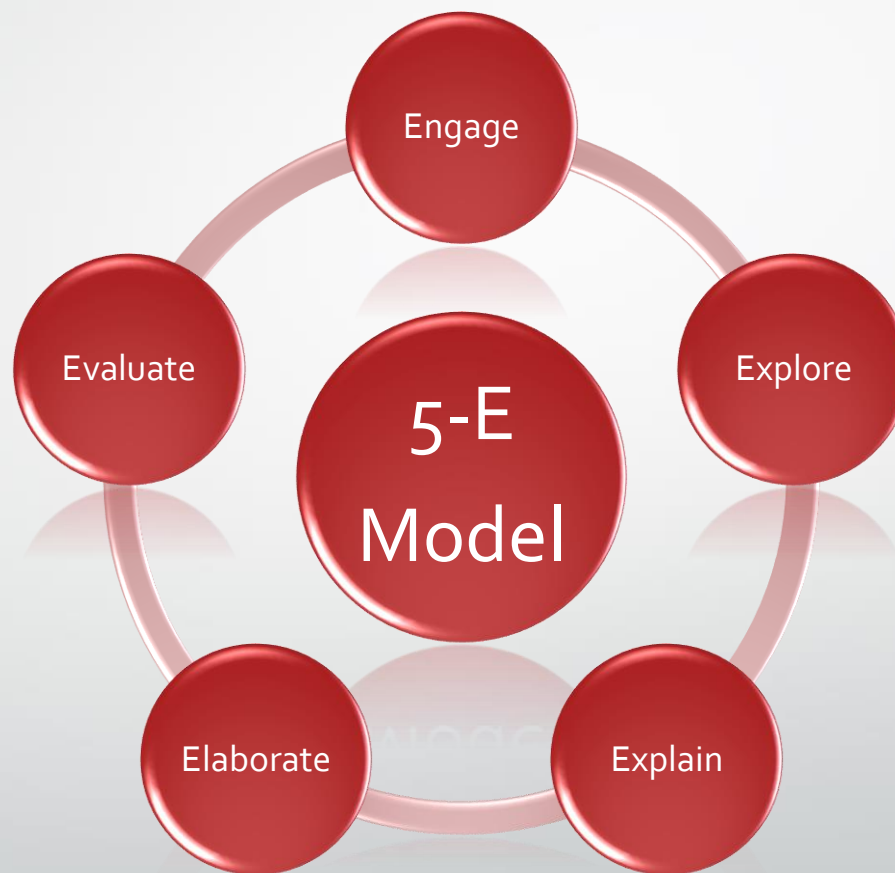


What is a 5-E Lesson?

- An instructional model that embodies a constructivist, inquiry-based learning approach by **engaging** students and allowing them to **explore** the concepts being introduced, discover **explanations** for the concepts they are learning. Student **elaborate** on what they have learned as they apply their knowledge to new situations. The 5E model affords many opportunities for **evaluation** of students' understanding of the concepts. (Orgill & Thomas, 2007)
- It is unique to the content and language development of students because it allows them to actively participate in their learning
- It may be taught over a series of days



5-E Model Components





Identifying Objectives

Snapshot

- Content Objective(s) – Taken from the TEKS; specific to this lesson; focuses on the learning outcome for this lesson

TEKS

Number, operation, and quantitative reasoning. The student uses fractions in problem solving situations. The student is expected to generate a fraction equivalent to a given fraction such as $\frac{1}{2}$ and $\frac{3}{6}$ or $\frac{4}{12}$ and $\frac{1}{3}$ (TEKS 5.2A).



CONTENT OBJECTIVE

Students will generate equivalent fractions and understand relationships between equivalent fractions.

- Language Objective(s) – Taken from the ELPS; specific to this lesson; connected to the content objective

ELPS

- Speak using grade level content area vocabulary to internalize new English words and build academic language proficiency (c3D).
- Narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired (c5G).



LANGUAGE OBJECTIVE

Students will record equivalent fractions on diagonal grid paper and express, both numerically and in words, the process used to generate equivalent fractions.



Identifying Objectives

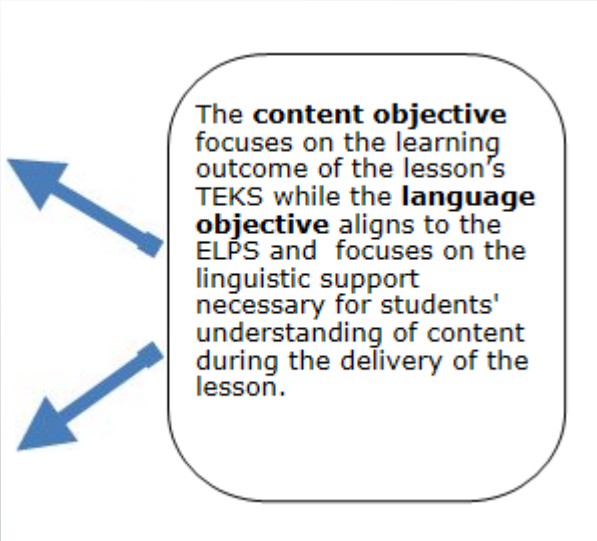
- What is the difference between a content objective and a language objective?

CONTENT OBJECTIVE

The students will be able to **generate** equivalent fractions and understand relationships between equivalent fractions.

LANGUAGE OBJECTIVE

The students will **record** equivalent fractions on diagonal grid paper and express, **both numerically and in words**.



The **content objective** focuses on the learning outcome of the lesson's TEKS while the **language objective** aligns to the ELPS and focuses on the linguistic support necessary for students' understanding of content during the delivery of the lesson.



Identifying College and Career Readiness Standards (CCRS)

- Purpose of CCRS – to identify and define the competencies and skills graduating high school students must possess in order to be successful in higher education and beyond
- An extension of the lesson's content and language objectives



College and Career Readiness Standards (CCRS)

- I. Numeric Reasoning
 - B. Number Operations
 - 1. Perform computations with real and complex numbers.
 - C. Solve problems involving rational numbers, ratios, percents, and proportions in context of the situation.

(Adopted by the Texas Higher Education Board on January 24, 2008)



TEKS for Technology Applications

- Use of technology – students are required to use technology to communicate, analyze, create, explore, and evaluate information
- Students need technology skills to work, live, and contribute in an increasingly digital and global society

pp. 48-51





Response to Intervention (RtI)

- Purpose – to meet the academic and behavioral needs of all students through a variety of services containing the following key elements:
 - High-quality instruction and scientific, research-based tiered interventions aligned with individual student needs
 - Frequent monitoring of student progress to make results-based academic and/or behavioral decisions
 - Application of student response data to important educational decisions (placement, intervention, curriculum, and instructional goals and methodologies)

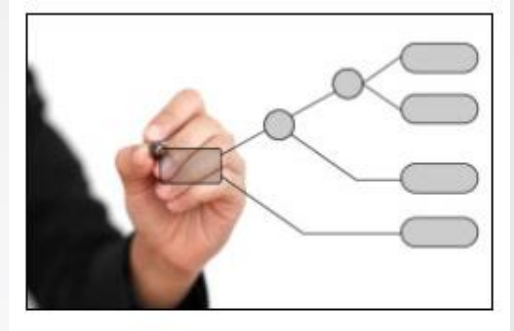
Support for academic and behavioral needs of all students (examples):

- Grouping configurations
- Visuals
- Linguistically-accommodated activities





Making Connections



- Lesson's activities and materials are **aligned** to the **individual needs** of ELLs based on their level of language proficiency in listening, speaking, reading, and writing.
- As we go through the math lesson, make note of the integration of the ELPS, TELPAS proficiency level descriptors, CCRS, RtI Elements, and linguistic accommodations
- Integration is **critical** for students to develop English proficiency and acquire content area knowledge and skills simultaneously



Vocabulary and Level of Language Proficiency

- Consider each student's individual level of language proficiency
- Vocabulary lists are accommodated to meet students' linguistic and academic needs





Composing Vocabulary Lists(s)

- **Academic Vocabulary** – academic terms connected specifically to the content area TEKS
- **Essential Vocabulary** – terms that may be integrated within any content area lesson
- **Vocabulary Instruction** – use research-validated practices for expanding students' vocabulary





Composing Vocabulary Lists(s)

- **Academic Vocabulary** – academic terms connected specifically to the content area TEKS
- **Essential Vocabulary** – terms that may be integrated within any content area lesson

Academic Vocabulary	Essential Vocabulary
Equivalent Fraction	Generate
Fraction	Process
Factor	Relationship
Numerator	
Denominator	
Partition(ed)	
Unit Fraction	
Non-unit Fraction	



Pre-Teaching Vocabulary

- **Before** the delivery of the lesson
- **Engage** portion of the lesson (linguistic accommodations/support)
 - Visuals
 - Manipulatives
 - Nonverbal cues
 - Kinesthetic activities



Engage

- ❖ Students are engaged by an object, event, or question
- ❖ Capture the students' interest for authentic student engagement
- ❖ Make connections to past and future activities
- ❖ Language helps students access prior knowledge and express interest, ask question, and make predictions about new concepts

ENGAGE

1. Place a long piece of masking tape on the floor to represent a **number line**. Add some benchmark numbers on the masking tape (0, 1/2, 1, etc.).
2. Distribute **Number Cards** to students.
3. **Prompt** the students that are holding fraction number cards to **place the cards (one at a time) on the number line** in the appropriate position.





Building Background Knowledge

- some students may not have the background knowledge required for a lesson
- May need to provide supplemental materials to meet the language need **without** reducing or modifying the content
 - Adapted text
 - Native language (as appropriate)
 - Multimedia
 - Manipulatives

Engage

Possible Sentence Stems for "Engage" in Math

I know...	I want to know...	What interests me is...
I think...	I wonder why...	_____ makes me wonder...
We already know...	Let's find out...	This reminds me of...
This is similar to...	This is different from...	We can find out more about this by...
One possibility is...	My suggestion would be...	Adding _____ would cause...
If ___ what would happen to ___?	If the pattern continues...	Removing _____ would cause...
The approximate ___ is...	I can compare this to...	



Building Background Knowledge

What background should teachers and students possess?

Teacher

- How students progress from additive to multiplicative reasoning.
- Every fraction that is equivalent to $\frac{1}{2}$ will have the invariant relationship that the numerator is half of the denominator. The invariant relationship exists for all fractions and their equivalents, even if the invariant relationship is more difficult to determine.
- The numerator and denominator of equivalent fractions vary by the same multiplicative factor from the original fraction. This covariance is embodied in the standard algorithm used to generate equivalent fractions.

Student

In fourth grade, students use concrete objects and pictorial models to generate equivalent fractions. This lesson builds on the previously taught operational skills (multiplication and division) which allow a better facilitation for the understanding of fractions.



Routines and Procedures for Language Development

- **Student Participation** – kinesthetic activities, whole-class and group discussions, and independent work
- Students must be familiar with the routines and procedures involved in each of these settings
- **Routines and Procedures**
 - must be carefully taught, modeled, and established;
 - Create a classroom environment that is more efficient, positive, and productive;
 - allows the teacher to focus on meaningful instruction;
 - allows students to concentrate on key concepts



Explore

Students explore objects and phenomena, often as part of a hands-on activity with guidance.

- ❖ Experience before introducing specificity of the lesson; allows for hands-on learning experience
- ❖ Language helps students to make observations, generalizations, and hypotheses about experiences with new concepts.

ELPS that can be used: 1a; 1c; 2d; 2e; 2h; 3e; 3i; 4f; 4j




Language Development Activities

- What are some examples of language development activities in the explore portion of the lesson?
- How are the ELPS implemented in this portion of the lesson?
- Facilitation for development – ask questions for further support of students' understanding

Explore

EXPLORE

1. Distribute the **Equivalent Fractions** activity pages to each student. 
2. Prompt the students to use the grid on each of the **Equivalent Fractions** activity pages to shade the fraction noted on each page.

*Teacher Note: A **Diagonal Grid Rectangle** is provided as an **optional** resource for students' use during this activity. The **Diagonal Grid Rectangle** can either be used as an introduction to gridding the fractions given or for additional practice in generating equivalent fractions. You will need to make additional copies of **Diagonal Grid Rectangle**, as needed.*

3. Prompt the students to continue to evenly partition (divide) each paper model into more parts to generate more fractions that equivalent to $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{5}{8}$.
4. Prompt the students to write the equivalent fractions that they generated onto the appropriate Equivalent Fractions activity page.

Teacher Note: Make sure that you convey explicitly that the whole is partitioned into equal parts.

Explore



Possible Sentence Stems for "Explore" in Math

I noticed...	_____ is identical to _____ .	I predict...
I will try _____ because...	This figure has ___ faces (edges/vertices, etc).	Since I know _____, I think that...
_____ might have caused the changes in...	_____ best explains the change in...	_____ is the length of _____.
The average _____ is.	_____ is equivalent to...	My estimate is ___ because...
The diagram (graph/table) shows _____.	I think _____ best explains the increase (decrease) in...	We might be able to solve this problem by...
The data that is most precise is _____ because...	According to the data (graph/table), the average _____ is...	



Explain

- ❖ Students explain their understanding of concepts and processes with the facilitation of the instructor
- ❖ Students hear, apply, and understand the vocabulary associated with the subject being studied
- ❖ Language helps students use formal academic language to describe content area concepts
- ❖ Teacher introduces explanations in a direct and formal manner

The key to this phase is to present concepts, processes, or skills

- briefly,
- simply,
- clearly, and
- directly.

ELPS that can be used: 1d; 3a; 3b; 3c; 3d; 3e; 3f; 3g; 3h; 3i; 3j




Equivalent Fractions Relationships Activity Pages

- What types of linguistic support are provided during the explain portion of the lesson?

Explain

EXPLAIN

1. Distribute the **Equivalent Fraction Relationships** activity pages to each student. 

*Teacher Note: Steps 2-8 will be repeated for each **Equivalent Fraction Relationships** activity page. Some Facilitation Questions may need to be appropriately adapted for each fraction given.*

2. Prompt the students to **use words to describe a process** for generating equivalent fractions.
3. Prompt the students to record (on the first table) the numerators and denominators of **5 of the equivalent fractions that they generated in the EXPLORE portion of the lesson.**
4. Prompt the students to **express numerically the process** used to generate the equivalent fractions in the space provided (on the first table) of the **Equivalent Fraction Relationships** activity page.

*Teacher Note: You may have to provide students with an **example** for the first equivalent fraction, being explicit while discussing the process used for generating equivalent fractions.*



Explain

Possible Sentence Stems for "Explain" in Math		
___ represents...	___ is an example of...	___ can be used to...
The term ___ means...	This pattern is an example of ...	___ is found in both ___ and ___.
The simplified form of ___ is...	___ best describes ___ because...	___ best explains the increase (decrease) in...
I can use the word (phrase) to describe...	___ results in the decrease (increase) in...	The label on the ___ represents...
This type of pattern is called ___ and can be observed in...	___ is a nonexample of ___ because...	



Elaborate

- ❖ Students participate in activities that allow students to apply concepts in contexts, and build on or extend understanding and skill.
- ❖ Students apply concepts in context and build on or extend their understanding and skill; students participate in reteach activities; students communicate their understanding of the content with others
- ❖ Language helps students apply, extend, and elaborate concepts using newly acquired academic language.

- ➔ Students may still have misconceptions
- ➔ Teachers provide opportunities for students to practice their learning in new contexts

ELPS that can be used: 1e; 2d; 3g; 4i; 5g



Elaborate

Generating Equivalent Fractions Activity Page (p. 31-33)

- What types of linguistic support are provided during the explain portion of the lesson?

ELABORATE

1. Provide the students with **Generating Equivalent Fractions** activity pages. 

*Teacher Note: Steps 2-6 will be repeated for each **Generating Equivalent Fractions** activity page. Facilitation Questions are specific for each given fraction. Use accordingly.*

2. Prompt the students to **describe their procedure** for generating fractions that are equivalent to the fraction given on each **Generating Equivalent Fractions** activity page and to **record their procedure** on the appropriate **Generating Equivalent Fractions** activity page.
3. Provide the students with **36 two-color counters**. Advise students that they will not be using all 36 two-color counters for each fraction. *Remember, students will be working on each **Generating Equivalent Fractions** activity page one at a time.*
4. Prompt the students to show with $12/16$ with 32 counters; $3/5$ with 30 counters; and $8/12$ with 36 counters.
5. Prompt the students to use the **two-color counters** to show their procedure for determining the numerator and denominator of a fraction equivalent to the fraction they are working on.
6. Prompt the students to **record their models in pictures**.



Elaborate

Possible Sentence Stems for "Elaborate" in Math		
We were able to...	_____ tells me...	_____ helps me...
Another example might be...	This relationship can be used to determine _____.	This can also be applied to...
We can use _____ when...	The strategy I used to find the solution is _____ because...	An increase (decrease) in _____ results in...
We can check our answer by...	Another way to solve this is...	A better way to determine _____ is...
Changing _____ in this pattern would result in...	This equation can be used to determine...	This equation...



Evaluate

- ❖ Students assess their knowledge, skills, and abilities
- ❖ Students assess their knowledge, skills and abilities; demonstrated in multiple measures (project based assessment, presentation, dialogue sharing, responding to a writing prompt; assists the teacher in designing future lessons
- ❖ Language helps assess current understanding and evaluate reasonableness of explanations.

Formal Assessments are

- data-driven,
- standardized in the manner they are administered and scored,
- grade-level or age specific, and
- measuring a student's level at a particular time of the year.

Informal Assessments are

- content and performance- driven, done at any time and more frequently,
- more student specific and interactive, and
- part of classroom instruction and do not have to be tests.

ELPS that can be used: 2l; 3g; 4j; 4k; 5g



Evaluate

- ❖ Teachers use different forms of assessment to meet the academic and language needs of ELLs.
- ❖ Some alternate forms of evaluation may include:
 - ❖ Matching
 - ❖ Drawing a picture with labels using academic terms
 - ❖ Responding to questions by pointing




Evaluate

Performance Assessment & Selected Response Activity Pages

(p. 34-37)

- What types of linguistic accommodations are made provided during the evaluate portion of the lesson?

EVALUATE	<ul style="list-style-type: none">• Provide each student with a Performance Assessment  activity page.• Upon completion of the activity page, use a rubric to assess student understanding of the concepts addressed in the lesson.• Prompt the students to complete the Selected Response activity pages.
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Note: Linguistic accommodations must be determined by individual student language proficiency levels. As a student's level of language proficiency increases, fewer linguistic accommodations will be necessary.





Evaluate

Possible Sentence Stems for "Evaluate" in Math

I learned...	I understand how...	As a result...
I still don't understand...	We still need to know...	We still need to know...
This answer makes sense because...	One thing I understand better is ___ because...	After considering _____ I think _____ because...
____ proves ____ because...	The best explanation for the similarity (difference) is...	Based on ____ we should ...
This solution is reasonable because...	____ best represents ____ because...	A reasonable conclusion we could draw if this pattern continues would be...
The best way to identify domain (range, length, etc.) is ____ because...		



Recap of Lesson's Components

- Content Objective
- Language Objective
- Language Supports
 - Listening
 - Reading
 - Speaking
 - Writing

How does this fit with Sheltered Instruction?

Sheltered Instruction Components

Lesson Preparation

Building Background

Comprehensible Input

Strategies

Interaction

Practice & Application

Lesson Delivery

Review and Assessment





How does this fit with Collaborative Strategic Reading (CSR)?

CSR Components

Preview

Read; Brainstorm;
Predict

Click & Clunk

Clunks & Fix-Up
Strategies

Get the Gist

Main Idea

Wrap Up

Question & Review



How does this fit with Writing Across the Curriculum (WAC)?

WAC Components

Read

Think

Write



Curriculum Implications



Instruction

- Strategy
- Activity
- Potential Pitfalls

Assessment

- In class
- District
- State





Comments / Questions



References

- Lead4Ward – lead4ward.com
- Region 13 ESC, *ELPS Toolkit*
- Texas Education Agency (TEA) – tea.texas.gov
- TEA, Project Share/Epsilen – *Implementing the ELPS in Mathematics*



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