

Lesson 11: Exploring Membranes, Part 2

(associated with EiE[®] Lesson 3, Part 2)

Lesson Topic: Exploring materials that could be used to make model membranes

DESIRED RESULTS (教学目标)

Academic Content Objectives: Students can...

Chinese Language Arts

- Analyze and apply morphological knowledge about characters to infer meaning of unfamiliar characters
- Use character analysis skills and knowledge of pinyin to predict new vocabulary
- Apply writing skills to record findings and observations in science notebooks
- Synthesize information from a concept map to construct a definition

Science and Engineering

- Describe the properties and functions of a natural membrane
- Identify similarities among properties of a natural membrane and certain household objects
- Give examples and non-examples of a “model”
- Predict, observe, analyze and compare the performance of six model membrane materials
- Construct reasonable explanations based on evidence
- Recognize the relationship between a model/engineer and an experiment/scientist
- Identify specific steps in the Engineering Design Process
- Observe, maintain records and monitor an engineering activity

Learning Strategies: Students can...

- Work cooperatively with a group
- Use a Frayer Model[®] (graphic organizer) to define a concept
- Use a graphic organizer (Bridge Map) to show a relationship
- Use a graphic organizer (Venn diagram or Double Bubble Map) to compare and/or contrast
- Make predictions

Chinese Language Objectives: Students can...***Functions and Forms*****Content-obligatory (CO)**

- Construct characters to form words and phrases adhering to character structure rules and stroke order guidelines
- Use a developing understanding of basic units of word formation in Chinese to infer and construct meaning with written text
- State use/function of something using nominalization and purpose verb phrase, 来+ verb + object
- State an analogy using preposition/coverb 对 and parallel A + B structure
- Give emphasis to the specific direct object by using 把 or 让/使 construction and placing the direct object before the verb
- Describe attributes of person/place/thing using modifying phrases
- Describe attributes of something/someone using nominalization within a 是的 sentence structure
- Describe attributes of something/someone using a predicative construction with the main noun modified by a relative clause
- State or identify what/who something is like/ is not like using a stative verb phrase 像.....一样
- Identify a design constraint
- Predict degree of probability of something using auxiliary “helping” verbs
- State quantities of materials using numbers and appropriate classifiers

Content-compatible (CC)

- State or identify what/who something is or is not
- Support ideas/opinions using compound sentences with adverb 因此
- Express agreement/disagreement
- Negotiate to reach consensus
- Make a request using different degrees of politeness
- Make inferences based on visual clues
- Give an example

Vocabulary

	了解 Recognize	识记 Produce
Content-obligatory	<p>Test Materials 铝箔纸 aluminum foil, 有一个孔的铝箔纸 aluminum foil with one hole, 有两个孔的铝箔纸 aluminum foil with two holes, 咖啡过滤纸 coffee filter, 纱布 cheesecloth, 毡布 felt, 海绵 sponge, 尼龙纱窗布 nylon screen</p> <p>Properties of Test Materials and Membranes 材料的特性 properties of materials, 薄膜模型的特性 properties of model membrane, 材料名称 material name, 闪亮 shiny, 能够控制流速 to be able to control rate of flow</p> <p>Experiment Words 流速 rate of flow, 水量 amount of water,</p> <p>Instructional Activity 辅助概念 supporting ideas, 科学日志 science journal</p> <p>Other Key Words 限制 constraint, 缺乏 scarcity, 节约/节省 save</p>	<p>Engineering Design Process 工程设计步骤 Engineering Design Process, 提问 ask, 思考 imagine, 设计 plan, 制作 create, 改进 improve, 步骤 step, 设计 to design, 模型 to model/modeling, 工程师 engineer, 实验 experiment, 科学家 scientist, 薄膜 membrane, 去解决实际问题 to solve real-world problems, 试一试新的想法 to try out new ideas, 运用想象力 to use imagination</p> <p>Test Materials 咖啡过滤纸 coffee filter</p> <p>Properties of Test Materials and Membranes 平滑 smooth, 厚 thick, 薄的 thin, 白色的/米色的 white/beige, 纸做的 made of paper, 有孔 has holes, 没有孔 does not have holes, 天热的薄膜 natural membrane, 人造的薄膜 human-made membrane, , 穿过/通过 to pass through, 流过 to flow through 阻挡 to block, 保护 to protect</p> <p>Experiment Words 推测 to predict/prediction, 可能管用 might work, 可能不管用 might not work, 有用/管用 works well, 没有用/不管用 does not work well</p> <p>Adverbs of Speed and Quantity 慢 slow, 中 medium, 快 fast, 全部 all, 部分 some, 没有 none</p>

	了解 Recognize	识记 Produce
Content-compatible	<p>Frayer Model® Concept Vocabulary 定义 definition, 功能 function, 特性 property, 中间的圆圈 center circle, 水坝 dam, 河狸做的坝 beaver dam, 体现 to represent, 像大自然一样 in a way similar to nature</p> <p>Objects That Are Like Membranes 漏杓 noodle strainer, 袜子 sock, 玻璃 glass, 保 plastic wrap, 盐罐 / 胡椒罐 salt/pepper shaker, 雨衣/风衣 rain jacket/wind breaker</p> <p>Action Words 偷看 to peek</p> <p>Rules 学校规则 school rules, 运动规则 sports rules</p> <p>Mind Maps® 集中智慧 to brainstorm, 维恩图 Venn Diagram®, 双泡泡图 Double Bubble Map®, 桥图 Bridge Map®</p> <p>Instructional Activities 问卷 survey, 圈出 to circle, 画图 to draw a picture, 选 to choose</p>	<p>Frayer Model® Concept Vocabulary 例子 example, 非例子 non example, 玩具汽车 toy car, 玩具房子 toy house, 玩具飞机 toy airplane, 汽车 car, 房子 house, 飞机 airplane, 青蛙的皮肤 frog skin, 实物 thing, 想法 idea 真正的 real, 不是真正的 unreal</p> <p>Adjectives 相似的 similar, 不同的 different, 真正的 real, 不是真正的 not real, 人造的 human made, natural</p> <p>Job Cards/Roles 中文督察员 Chinese Champion, 材料管理员 Magnificent Materials Manager, 记录员 Remarkable Recorder, 工作管理员 Terrific Taskmaster, 演示质检员 Polished Presenter</p>

Note: In the **Language-Function-Form-Vocabulary Connection** section you will find additional vocabulary that is directly supportive of the various language functions. The particular words and phrases you choose to target will depend on your students' proficiency levels. Because of this, we have not included all vocabulary here. At the end of this lesson, you will find a table that provides more detailed information about the lesson vocabulary identified above.

PREPARATION (教学准备)**Materials Needed for Instruction**

- Engineering is Elementary® (EiE®) binder, Lesson 3, Part 2: Materials, page 86
- Interactive whiteboard pages: MMIC 11-IWB
- 12 Mystery Bags (paper lunch bags, each labeled with the number 1 to 12, with one model membrane testing material inside each)

Note: *There are 6 materials, so each material will be placed into 2 bags.*

- Five large sheets of white construction paper, one per group
- Students' science notebooks
- Laminated job cards for group work
- Digital camera for taking photos of the experiment
- Handouts:
 - a. MMIC 11-1: *Frayer Model® Concept Map*, one per student
 - b. MMIC 11-1-TG: *Frayer Model® Concept Map*, Teacher Guide
 - c. MMIC 11-2: *Model Membrane Materials Mystery Bag*, one per student
 - d. MMIC 11-3: *Model Membrane Materials Prediction Survey*, one per student
 - e. MMIC 11-4 (EiE® {3-3}): *Testing Model Membrane Materials*, one per group

Note: *EiE® {3-3} is being used instead of EiE® {3-2}.*

LEARNING ACTIVITIES (教学活动)

Preview Phase—“Intro” Activities

The teacher and students will co-construct a Frayer Model® Map for “model”. Students will review the properties of natural membranes. They will use a Double-Bubble Map or Venn diagram to compare the properties of some common household objects and the properties of natural membranes to see how these objects are like or are not like natural membranes. Students will review Juan Daniel’s motivation for creating a model membrane for his frog and talk about constraints. Students will then learn the vocabulary for the model membrane materials and prepare the materials and set up the experiment for testing possible materials for model membranes.

Time: Learning Activity 1—20 minutes
Learning Activity 2—20 minutes
Learning Activity 3—10 minutes
Learning Activity 4—60 minutes

Note: Read “Part 2: Preparation” on page 87 in the EiE® binder. Before beginning this lesson, you will need to prepare materials for the testing of model membrane materials activities. Disregard number 9 on page 87.

Learning Activity 1





Note: This activity is an expansion of Step 1 of “Part 2: Introduction” on pages 88 in the EiE® binder. It is designed to activate students’ prior knowledge and language about models and to reinforce how concept maps can help develop understanding of new concepts.

1. Step 1: What is a Model? Follow instructions for Step 1 on page 88 in the EiE® binder.
2. Show page 1 from MMIC 11-IWB that displays different images of models. Ask students to recall the new word they used in lesson 10 to talk about these pictures 模型 (model).
3. Distribute MMIC 11-1: *Frayer Model® Concept Map*, one copy per student, and display the handout on page 2 of MMIC 11-IWB.
4. Guide the students in writing the word “model” in the center circle of the handout and tell students that together they are going to fill in a concept map to clarify their understanding of this important word.
5. Invite students to share ideas for each of the four quadrants of the Frayer Model® Concept Map. As they do so, jot their ideas down on the whiteboard, expand on them as needed, and ask students to do the same on their own concept map. See MMIC 11-1-TG: Frayer Model® Concept Map, Teacher Guide for an example of a completed concept map for defining “What is a model?”
6. Display page 3 of MMIC 11-IWB. Using information from the Frayer Model® Concept Map, co-construct a definition of the word “model” with the students on the whiteboard, and have them write the definition on their handout.

7. Referring again to the questions on page 2 of the handout, displayed on pages 3-4 of MMIC 11-IWB, ask:

中文	English
什么样的专业人员使用模型? (工程师)	What kinds of professionals use models in their work? (Engineers)
有没有人会完成这个“桥”? (模型对工程师就像实验对科学家; 工程师做模型对科学家做实验。)	Can anyone think of how we might complete the Bridge Map? (A model is to an engineer as an experiment is to a <u>scientist</u> ; Engineers work with models; scientists work with experiments.)

8. Ask students to look at the second Bridge Map displayed on page 4 of MMIC 11-IWB and to tell the missing word to a partner. Invite one student to come and write the missing word on the whiteboard.
9. Tell students that just as they had the chance to act as a scientist and conduct an experiment with raisins to learn about membranes, in this lesson they will have the chance to act as an engineer and make a model membrane for Juan Daniel’s frog.

Language Function-Form-Vocabulary Connections (Activity 1)		
CO LP 11.1.1	Construct characters to form words and phrases adhering to character structure rules and stroke order guidelines	
<p>For example:</p> <p>Left-right: 叫、场</p> <p>Top-bottom: 吉、只</p> <p>Left, middle, right: 树、谁</p> <p>Top, middle, bottom: 复、常</p> <p>One-part, totally enclosed: 国、回</p> <p>Partially enclosed: 用, 原</p>		
Approaching	Attaining	Expanding
<p>One- and two-part characters</p> <p>One-part character 我、生</p> <p>One-part, totally enclosed 国、回</p> <p>Two-part characters Left-right: 叫、场 Top-bottom: 吉、只</p>	<p>Three-part characters</p> <p>Left, middle, right: 树、谁</p> <p>Top, middle, bottom: 复、常</p> <p>Left, top-right, bottom-right: 锋、纷</p> <p>Top-left, bottom-left, right: 部、剂、劲</p> <p>Left-top, right-top, bottom: 然、赞</p> <p>Top, left-bottom, right-top: 死、前</p>	<p>Four + part characters</p> <p>Left-top, right-top, left-bottom, right bottom: 能、舒</p> <p>Left, top-right, middle-right, bottom-right: 慢、镜</p> <p>Left, middle, top-right, bottom-right: 游</p> <p>Left, middle-top, middle-bottom, right: 湖</p>
Form focus: Formation of Chinese characters		
1. Character structure rules		
<p>Chinese characters are called “square” characters because no matter how simple or complex, each character fits inside a square. Characters can usually be divided into different parts. These parts form character structures. There are four main structures: one-part structure, two-part structure, three-part structure, and four-part structure. These structures can be further divided into sub-parts.</p> <p>For example,</p> <p>Two-part structures:  (top/bottom),  (left/right)</p> <p>Three-part structures:  (left, top-right, bottom-right),  (top-left, bottom-left, right), etc.</p>		

2. Stroke order guidelines

General rules for writing Chinese characters are:

1. Horizontal first, then vertical.
2. Top first, then bottom.
3. Left first, then right.
4. Left-slanted first, then right-slanted.
5. Outside first, then inside.
6. Center first, then both sides.
7. With “closed” characters, enter character first, then close it up.

CO LP 11.1.2	Use a developing understanding of basic units of word formation in Chinese to infer and construct meaning with written text
Form focus: radical → character → compound/word	
1. radical	
<p>A radical is the smallest meaningful orthographic unit in compound characters, for example, 虫 (insect) is used in the character 蛙 (frog). 虫 (insect) can also be a stand-alone character. There are three types of radicals: semantic (give information about character meaning) [手 (hand)], phonetic (give information about character pronunciation) [分 (fen) in the compound 纷 (one after another)], and perceptual (do not give information about character meaning or pronunciation, instead function as visual fillers) [此 (this, these in classical Chinese), however, in the compound 嘴 (mouth) the radical 此 functions as a perceptual radical providing information about neither meaning nor pronunciation].</p>	
2. character	
<p>A Chinese character is a meaningful orthographic unit that is always pronounced as one syllable. Chinese characters have evolved as a writing system over millennia and have developed in various ways.</p> <p>Some characters are pictographs that were originally drawings of concrete objects, for example, 雨 (rain), the four dots depicting the rain coming down from the sky; others are better described as ideographs because they were created as graphic representations of more abstract ideas such as the notion of “above”, 上, the stroke above the horizontal line indicating the idea of “above” or “up.” Another way to create characters was to combine two or more pictographs or ideographs to portray a new meaning, for example, 休 (to rest), a combination of the pictographs for person, 人, and a person leaning against a tree, 木. These types of characters are referred to as ideogrammatic characters.</p> <p>Over 90% of Chinese characters were created as phono-semantic compound characters and are made up of a combination of semantic and phonetic radicals. For example, 控 (to control), the semantic radical on the left side, 手 (hand), indicates that the word meaning will include an action with a hand, and the phonetic radical on the right side 空 (kōng), helps the reader with character pronunciation “kòngg.”</p>	

3. compound
<p>Compounds consist of at least two characters, neither of which is an affix, a character that on its own lacks meaning but when added to other characters becomes a meaningful unit. Most Chinese words are compounds. Compounds have various types of syntactic relationships.</p> <p>A few compound types:</p> <p><i>Verb-Object</i>: 踢足球 (to kick soccer ball)、开球 (to kick of)、发誓 (to pledge)</p> <p><i>Verb-Complement</i>: 摔倒 (to fall down)、改进 (to improve and get better)、进来 (to come in)</p> <p><i>Subject-Predicate</i>: 天亮 (bright [sky is bright])</p> <p><i>Number-Classifier</i>: 各种 (various kinds)、一道 (a ray of...)、一片 (a patch of...)</p> <p><i>Adverb-Verb</i>: 慢跑 (to jog [to run slowly])、快走 (to hurry [to walk fast])</p> <p><i>Verb-Verb-Noun</i>: 栖息地 (habitat [to stay and rest at a place])</p> <p><i>Adjective-Adjective-Noun</i>: 浅桃色 (light peach color)、吉祥物 (mascot [happy and auspicious object])</p>
4. word
<p>A word is written with one or more Chinese characters. A word can consist of a single character (脚, foot), a compound (幸运, lucky), a duplicate (招招手, to wave), or an affixed form (第一, first, 第二, second, etc.).</p>

CO LP 11.1.3	State use/function of something using nominalization and purpose verb phrase, 来+ verb + object		
Approaching	Attaining	Expanding	
模型体现一个想法。	模型是用来展示新的想法和解决实际问题(的)。	模型的功能是让人们展示一个新的想法和解决实际问题。	
Models represent an idea.	Models are used for showing new ideas and solving a real-world problem.	The function of a model is to allow people to show a new idea and solve a real-world problem.	
Subject + verb + object.	Subj. + verb 是 + nominalization [verb 用 + purpose verb phrase (来+ verb ₁ + object ₁ + conjunction 和 + verb ₂ + object ₂) + 的].	Noun phrase [Noun + 的 to indicate possession + noun] + verb 是+ “让/使-construction” [verb 让+ object + verb phrase (verb ₁ + object ₁ + conjunction 和 + verb ₂ + object ₂)].	

Form focus
1. Nominalization using 的
<p>A verb/verb phrase can become a noun by placing the particle 的(de) after it. For example, the verb phrase 你说 (you say) can function as a noun phrase 你说的, meaning “what you say” in 你说的是 (What you say is...).</p> <ul style="list-style-type: none"> • If the subject is expressed in the verb phrase 你说 (you say), it is likely that the noun phrase, 你说的 (what you say), will function as the direct object in the sentence, in this case, the “what” you say. • If the direct object is expressed in the verb phrase, e.g., 种水果 (grow fruit), it is likely that the noun phrase, 种水果的, will function as the subject of the sentence, as that is the information that is lacking.
2. Multiple uses of 来
<ol style="list-style-type: none"> 1. “来” as an action verb, meaning “to come”. e.g., 他昨天来过两次。 (He came twice yesterday.) 2. “来” is used to replace the verb in previous sentence. e.g., 把这杯茶喝完, 我们再来一瓶! (Drink up this cup of tea, we will drink another!) 3. “来” is placed in front of a verb phrase, indicating purpose. e.g., Juan Daniel 需要水杯来喝水。 (Juan Daniel needs a water bottle to drink water.) 4. “来” is used to indicate the direction of an action verb. e.g., 你把那本书拿来! (Bring that book over here!)
3. Use of 把- and 让/使-construction
<p>Similar to “把-sentence,” the “让/使-construction” allows one to place the direct object in front of the main verb, which is not typical word order in Chinese. This draws more attention to what is happening to the object itself.</p>
Noticing and awareness spotlight
1. Use of “noun + 的 + noun” to express possession
<p>To indicate ownership/possession, the structure is “noun + 的 + noun”, for example, 青蛙的基本需要 means a frog’s basic needs.</p>

CO LP 11.1.4	State an analogy using preposition/coverb 对 and parallel A + B structure	
For example:		
Approaching	Attaining	Expanding
工程师和模型是一对，科学家和实验也是一对。	模型对工程师就像实验对科学家。	工程师做模型对科学家做实验。
Engineers and models make a pair, scientists and experiments also make a pair.	A model is to an engineer as an experiment is to a scientist.	Engineers work with models; scientists work with experiments.
Part A [Subj. + verb + object]], Parallel part B [Subj. + adv. + verb + object].	Part A [Noun + prepositional phrase (对 + object)] + adv. + verb + parallel part B [noun + prepositional phrase (对 + object)].	Part A [Subj. + verb + object]+ preposition 对 + parallel part B [subj. + verb + object].
Form focus		
1. Parallel “A + B” structure		
<p>In Mandarin, there is a fondness for balanced, parallel structure in syntax such that one type of syntax, e.g., SVO, is mirrored by the same type (SVO) in a later part of the sentence. The sentences above provide a few clear examples. Parallel A + B structure is particularly useful in expressing an analogy. For example,</p> <p>Part A [Noun + prepositional phrase (对 + object)] + adv. + verb + parallel part B [noun + prepositional phrase (对 + object)].</p> <p>模型对工程师就像实验对科学家。 A model is to an engineer as an experiment is to a scientist.</p>		
2. Coverbs/Prepositions		
Prepositions are often referred to as coverbs. They are called coverbs because they are partly like verbs and partly like prepositions. Most coverbs used to be verbs at earlier stages of the language and many still have characteristics of verbs and can be used as verbs that have similar meanings, for example, 给 (gěi) as a verb means “to give” and as a preposition/coverb it means “to” or “for.” See other examples above.		
Approaching	Attaining	Expanding
把 (direct object marker) 比 (compare) 从 (from)..... 到 (to a place) 给 (for, to) 跟 (with)	除了 (except, besides) 对[于] (concerning, with regard to) 关于 (concerning, with regard to)	至于 (concerning, with regard to) [根]据 (according to) [依]照 (according to) 靠 (depend on)

和 (with, and)	为[了] (for, in order to) 由于 (because of, due to)	离 (separated from) 像 (like)
Noticing and awareness spotlight: The multiple meanings of “对”		
1. As a preposition, “对” means “concerning, with regard to.”		
2. As a classifier, “对” means “a pair of.”		
3. As an adjective, “对” means “correct.”		

CC LP 11.1.5	State or identify what/who something is or is not	
For example:		
Approaching	Attaining	Expanding
这 (不) 是模型。	这个东西 (不) 是模型。	这个东西 (不) 是模型的例子。
This is/is not a model.	This object is/is not model.	This object is not an example of a model.
Pronoun (这) + predicate (verb (是) + noun).	Pronoun (这) + (CL + subj.) + predicate (verb (是) + noun).	Pronoun (这) + (CL + subj.) + predicate [verb (是) + noun phrase (adj. + 的 showing possession + noun)].
Form focus		
不 (bù) is an adverb that means “not.” Like most adverbs, 不 (bù) always appears before the verb, in this case, 是.		
这是 a pronoun and means “this, these.” It may or may not be followed by a classifier (CL) and a noun, for example,		
这个人 是 工程师。 (This person is an engineer.)		
这是 工程师。 (This is an engineer.)		
Noticing and awareness spotlight: 个人/东西 vs. 位女士/男士		
The classifier 个 is the most commonly used classifier when referring to people or things. To indicate more respect for the person being referred to, use 位女士/男士, a more formal classifier + noun for people.		

Learning Activity 2

Note: This activity is an expansion of Step 2 of “Part 2: Introduction” on pages 88 in the EiE[®] binder. It is designed to activate students’ prior knowledge and language about membranes and to reinforce how graphic organizers can help develop understanding of new concepts.

1. **Step 2:** “What have we learned about membranes?” Follow the instructions for Step 2 on page 88 of the EiE[®] binder.
2. Add the following activity to Step 2 to help students recall the properties of natural membranes. Invite students to think back to the simulation activity from Lesson 9, where some students formed lines to “act” like membranes and others became elements that tried to pass through the membranes. Ask students to turn to a partner and tell their partner what they remember learning about membranes from that activity and from their experiment with raisins. Debrief this with the whole class by putting student-generated ideas into a graphic organizer called “Properties of Natural Membranes” on page 5 of MMIC 11-IWB.
3. Next, hold up a coffee filter or tea bag and ask students if anyone remembers what the object is called. Then tell students the name and write the character for the word on the whiteboard. Ask:

中文	English
你会用什么字/词来形容这个东西? (白色的/米色的、薄的、纸做的)	What words would you use to describe this object? (white/beige, thin, made of paper)
回想一下你学到的关于薄膜的知识, 你觉得这个东西跟薄膜相似还是不同?	Keeping in mind what you have learned about membranes, do you think this object is similar to or different from a membrane?
这个东西跟薄膜有什么相同的特性? (它有肉眼看不到的小孔; 可以让水通过; 不让咖啡渣/茶叶通过) 注意: 画一个草图来表示这个特性。	What properties does this object have in common with a membrane? (It has holes that are too small to see, lets water pass/flow through it, does not let coffee grounds/tea leaves flow through.) Note: Draw a quick picture to show this happening
有什么不同? (它不是一个真正的薄膜; 它像一个薄膜)	How is it different? (It is not a real membrane; it is LIKE a membrane.)

4. Place students in five small groups. Introduce the names of five real household objects and their images and characters on page 6 of MMIC 11-IWB. Possible objects: 漏杓 (noodle

strainer), 袜子 (sock), 玻璃 (glass), 保鲜膜 (plastic wrap), 盐罐 / 胡椒罐 (salt/pepper shaker), 雨衣/风衣 (rain jacket/wind breaker).

- Next, allow the student groups to compare and contrast natural membranes with the five objects using a Double-Bubble Map or Venn diagram on page 7 of MMIC 11-IWB. Students should identify the properties that are similar and those that are different.

Note: Students will draw their own graphic for this on a large sheet of white construction paper.

- Post the following steps for this task on page 8 of MMIC 11-IWB for students to refer to during the activity:

中文	English
在纸上写出每个小组成员的名字	Write the names of each group member on your paper.
把你们观察的物体的名称写下来	Write the name of the object you are working with as the title.
讨论一下这个物体跟天然的薄膜有什么相似和不同的地方	Discuss how your object is similar to and different from a natural membrane.
选择一个你们要用的系统图	Choose the graphic organizer you will use.
在你们选择的系统图上写出这个物体跟天然薄膜相同和不同的特性	On your graphic organizer, write the properties that your object has in common with a natural membrane and those that are different.
画出这个物体作为或者不可能作为天然薄膜	Draw a picture of the object either acting like a natural membrane or not.
以小组为单位准备一下介绍小组的成员并口头演示你们对比的系统图。注意要用这些句型： X 像天然的薄膜一样，因为它 / 它有..... X 不像天然的薄膜，因为它 / 它有.....	Prepare to introduce group members and orally present your compare and contrast graphic as a group using these sentence frames: <ul style="list-style-type: none"> X object is like a natural membrane because it is / it has... X object is not like a natural membrane because it is / it has...

- When students are finished, invite groups to present their diagrams to the class.
- Collect diagrams as evidence of learning.

Language Function-Form-Vocabulary Connections (Activity 2)		
CO LP 11.2.1	Give emphasis to the specific direct object by using 把 or 让/使 construction and placing the direct object before the verb	
Approaching	Attaining	Expanding
薄膜阻挡有害的东西在外面, 例如灰尘。 Membranes block/stop harmful things outside, for example, dirt.	薄膜把有害的东西挡在外面, 例如灰尘。 Membranes protect by keeping harmful things out, for example, dirt.	薄膜让别的东西经过, 像空气或者水。 Membranes let some things pass through, such as air and water.
Subj. + Verb + Object + Complement (adv.), for example, ...	Subj. + 把-construction [把 + object + verb + adv. phrase [得 (adv. marker) + adv.]], for example, ...	Subj. + 让/使-construction [让/使 + direct object + verb], such as, ...
Form focus		
1. Use of 把-construction vs. simple SVO (Subj.-verb-direct object)		
<p>A 把-construction (including 把 + direct object + verb + complement) will typically reference something specific that the speaker thinks the hearer knows about, not something unknown to the hearer.</p> <p>If a sentence <i>communicates something that happens to the direct object</i>, then use of the 把-construction is appropriate.</p> <p>For example,</p> <ul style="list-style-type: none"> Juan Daniel 把球踢进了。(Subj.+把 + direct object noun phrase + verb + directional complement + past tense marker.) Juan Daniel kicked the soccer ball in. 我们把这个想法放/写在这个部分。(Subj. +把 + direct object noun phrase + verb + locative complement.) We wrote/put our ideas in this section. <p>However, if there is <i>no additional information given as to what has happened to the direct object</i>, use of a 把-construction is incorrect. For example, in the sentence below, the 把-construction is not allowed:</p> <p>Juan Daniel 想他的青蛙。(Subj. + verb + direct object noun phrase) Juan Daniel misses his frog.</p>		

CO LP 11.2.2	Describe attributes of person/place/thing using modifying phrases		
For example: 有小孔的茶叶袋 (the tea bag that has tiny holes) 光亮的、保护食物的铝箔纸 (the aluminum foil that is shiny and protects food)			
Approaching	Attaining	Expanding	
绿色的(green) 湿的(wet) 光亮的 (shiny) 厚厚的 (thick) 薄的 (thin) 白色的(white) 米色的(beige) 平滑的(smooth)	有小孔的 (that has tiny holes) 没有孔的 (that does not have holes)	让水通过的 (that allows water to pass through) 阻挡某些东西通过的 (that blocks some things from passing through) 有小得眼睛都看不见的孔的 (that has holes that are too small to see)	
Attributive adjective [adj. + 的] + Head noun	Relative clause [(没)有 + noun + 的] + Head noun	Relative clause [verb + noun + 的] + Head noun Relative clause [verb 有 + adj. + “得 + noun phrase as degree complement” + noun + 的] + Head noun	
Form focus			
1. Relative clause [verb + noun + 的] + Head noun			
Modifying phrases can be either attributive adjectives, e.g., 薄的 (thin) or relative clauses, e.g., 有 (have) 小孔 (tiny holes) + 的 (that has tiny holes). Modifying phrases are placed in front of the head noun (e.g., 提供栖息地的热带雨林).			
2. Use of particles 的、地、得			
<p>的 (de) is used when an adjective and/or a pronoun modifies a noun. The form is: Adj./pron. + 的 + Noun, for example, 炎热的夏天 (sweltering summer), 我们的薄膜模型 (our model membrane design)</p> <p>地 (de) is used when an adverb modifies a verb. The form is: Adv. + 地 + Verb (unlike in English!), for example, 高兴地欢呼 (cheer happily)</p> <p>得 (de), as a potential complement, is used as a complement to further describe a main verb/adjective. It is placed after the verb/adjective it describes. The form is: Verb/adjective + 得 + degree complement</p>			

<p>The degree complement can be made up of an adverb or a noun phrase.</p> <p>For example,</p> <p>我跑得快。(I ran fast.) (得 + adverb as degree complement)</p> <p>薄膜有一些小得眼睛都看不见的孔。(Membranes have holes that are too small to see.) (得 + noun phrase as degree complement)</p>
Noticing and awareness spotlight
1. The negation of 有 (have) is 没有
<p>The negative particle 没 (méi), not 不 (bù), must be used to negate 有 (yǒu) [have].</p> <p>没 can be used by itself to express 没有 (méi yǒu). If 没 is used by itself, 有 is assumed such that 没 = 没有.</p>
2. Adjective repetition
<p>Adjective repetition occurs frequently in Chinese. There are different ways to do this:</p> <ol style="list-style-type: none"> “aa” form, e.g., 长长 (very long), 厚厚 (thick)、薄薄 (thin)*; “abb” form, e.g., 白皑皑 (snow-white, pure white, as very white as snow), 毛茸茸 or 毛茸茸 (hairy or downy), 亮晶晶 (glistening, sparkling, shining), 湿漉漉 (wet, moist); “aabb” form, e.g., 清清楚楚 (clear), 恍恍惚惚 (in a trance, absent-minded), 红红火火 (as very red/warm as fire). <p>* Use of double adjectives is typical for young children.</p>
3. The “monosyllabic” rule and use of 的
<p>When describing persons, places and things, the use of 的 between adj. and noun will occur if the adjective is made up of more than one syllable, for example, 两只有蹼的脚 (two webbed feet).</p> <p>However, use of 的 between the adjective and noun is omitted if the adjective is only one syllable. For example, 两只大眼睛 (two big eyes).</p>

CO LP11.2.3	Describe attributes of something/someone using nominalization within a 是 ... 的 sentence structure	
Approaching	Attaining	Expanding
塑料做的(plastic-made) 钢筋做的(steel-made) 布做的(cloth-made) 毛做的 (hair-made) 木头做的(wood-made) 石头做的(stone-made) 竹子做的 (bamboo-made) 泥做的 (clay-made) 橡皮做的 (rubber-made)	用塑料做的 made of plastic 用钢筋做的 made of steel 用布做的 made of cloth 用毛做的 made of hair 用木头做的 made of wood 用石头做的 made of stone 用竹子做的 made of bamboo 用泥做的 made of clay 用橡皮做的 made of rubber	咖啡滤纸所用的材料 是..... The material that a coffee filter uses is ...

人造的 (human-made) 天然的 (natural)		
茶叶袋是人造的。 The tea bag is human-made.	雨衣是用塑料做的。 The rain jacket is made of plastic.	咖啡滤纸所用的材料是纸做的。 The material that is used by a coffee filter is paper.
Subj. + predicate (verb 是 + adj. [noun + verb 做] + 的).	Subj + verb 是 + nominalization [verb phrase (用 + noun + verb 做) + 的].	Relative clause [noun + particle 所 indicating passive voice + verb + 的] + head noun + predicate (verb 是 + adj. + 的).
Form focus		
1. Simple descriptive sentence (Subj. + 是 + adj. + 的)		
The “是 + adj. + 的” structure is commonly used to describe something or someone. For example, 这个物件是天然的。(This object is natural.)		
2. Nominalization using 的		
A verb/verb phrase can become a noun by placing the particle 的(de) after it. For example, the verb phrase 你说 (you say) can function as a noun phrase 你说的, meaning “what you say” in 你说的是 (What you say is...).		
<ul style="list-style-type: none"> • If the subject is expressed in the verb phrase 你说 (you say), it is likely that the noun phrase,你说的 (what you say), will function as the direct object in the sentence, in this case, the “what” you say. • If the direct object is expressed in the verb phrase, e.g., 种水果 (grow fruit), it is likely that the noun phrase, 种水果的, will function as the subject of the sentence, as that is the information that is lacking. 		

CO LP 11.2.4	Describe attributes of something/someone using a predicative construction with the main noun modified by a relative clause	
For example:		
Approaching	Attaining	Expanding
漏杓和薄膜一样/不一样。 A noodle strainer and a membrane are the same/different.	有孔的漏杓和天然的薄膜很相似/不同。 A noodle strainer that has holes and natural membranes are similar/different.	有孔的漏杓和天然的薄膜大同小异/大相径庭。 A noodle strainer that has holes that eyes can see and a natural membrane are generally the same but a little bit different /dramatically different.

A + 和/跟 (and) + B + 一样 (same)/不一样 (different)	Modifying phrase [verb phrase + 的] + noun + and + adjective + 的 + noun + [是 assumed] + intensifier + adjective.	Modifying phrase [verb phrase + 的] + noun + and + adjective + 的 + noun + [是 assumed] + four-character idiomatic expressions.
Form focus: Use of verb phrase or relative clause to describe main noun		
<p>There are several ways to describe persons/places/things. One way is to use a verb phrase and tell what the person/thing does. For example,</p> <p>蜥蜴和青蛙一起住。 A lizard and a frog live together. 前锋 + 射门得分。 A forward kicks the ball and scores goals. 水瓶 + 盛水。 A water bottle carries water.</p> <p>Another way to describe something/someone is to use a relative clause: a nominalized verb + object + 的 clause placed in front of the noun being modified. For example, 蜥蜴和青蛙住的 + 地方 - The places that a lizard and a frog live in... 一个设计科技的 + 人 - “someone who designs technology” 设计宇宙飞船的 + 航空工程师 - “An aerospace engineer who designs spaceships”</p> <p>A third way to describe someone/something is to use the predicative adjective “Subj. + (“be” Verb 是 understood) + adjective” construction either by itself or in combination with a relative clause. An example of the latter is, 蜥蜴和青蛙住的地方很相似。 The places that a lizard and a frog live in are very similar.</p>		
Noticing and awareness spotlight		
1. Use of four-character idiomatic expressions		
<p>Four-character idiomatic expressions are commonly used phrases that carry a great of meaning beyond the four characters themselves. They have their origins in traditional Chinese stories, myths and historical facts and are best understood within these contexts. There are about 5,000 such expressions in use. A few commonly used four-character idiomatic expressions that can be found in <i>Juan Daniel's Fútbol Frog</i> are:</p> <p>小心翼翼 (very carefully) 一泄千尺 (fall down one thousand feet, fall far down, cascade down)</p> <p>To pique student curiosity about these idiomatic expressions, teachers will need to research their origins and discuss the historical context with students.</p>		

CO LP 11.2.5	State or identify what/who something is like/ is not like using a stative verb phrase 像.....一样	
For example:		
Approaching	Attaining	Expanding
这(不)是薄膜。 This is/is not a membrane.	漏勺像薄膜一样。 The noodle strainer is like a membrane. 保鲜膜不像薄膜。 Plastic wrap is not like a membrane.	这个茶叶袋的功能跟薄膜很相似。 This tea bag's function is very similar to that of a membrane.
Pronoun (这) + predicate [Verb 是 + noun].	Subj. + stative verb (像) + noun + adv. (一样 exactly). Pronoun (这) + subj. + negative particle + stative verb (像) + noun.	Noun phrase (Pronoun (这) + CL + noun + 的 showing possession+ noun) + preposition phrase (preposition 跟+ object) + adv. + verb (相似).
Form focus		
1. Stative verbs		
<p>Stative verbs are used to describe situations that do not involve action. Examples include 喜欢 'to like,' 爱 'to love,' 像 'to resemble,' 想 'to want,' 要 'to want,' 需要 'to need,' 怕 'to fear,' 尊敬 'to respect,' 感谢 'to appreciate,' 懂 'to understand,' 信 'to believe,' and 想念 'to miss.'</p> <p>这个人像工程师。 (This object resembles a membrane.)</p> <p>Stative verbs can be modified by adverbs of degree. The adverb will be placed directly in front of the stative verb. For example, 这个物品很像飞机。 (This object looks a lot like an airplane.)</p>		
2. Use of preposition 跟		
<p>The preposition/coverb 跟 has several different uses. A useful sentence structure that uses this preposition is as follows: Subj./topic + preposition phrase (preposition 跟+ object) + verb + (noun phrase).</p> <p>我想跟她/他做葡萄干实验。 I want to do the raisin experiment with her/him.</p> <p>Juan Daniel 和他的朋友们跟镇上的其他男孩子们比赛踢球。 Juan Daniel and his friends play soccer with the other boys in town.</p>		

Noticing and awareness spotlight	
1. Use of negation adverb 不 (bú) with stative verbs	
不 (bú) is an adverb that means “not.” Like most adverbs, 不 (bú) always appears before the verb, in this case, 像, a stative verb.	
For example, 这个人不像工程师。 (This person does not seem like an engineer.)	
2. Use of “像……一样” and 不像……	
To describe similarities, use “像……一样” structure	
To describe A is not like B, use 不像……; “一样” is no longer used.	

CC LP 11.2.6	Give an example		
Approaching	Attaining	Expanding	
薄膜阻挡有害的东西在外面, 例如灰尘。	薄膜把有害的东西挡在外面, 例如/像灰尘。	薄膜让别的东西经过, 举个例子空气和水。	
Membranes block/stop harmful things outside, for example, dirt.	Membranes protect by keeping harmful things out, for example, dirt.	Membranes let some things pass through, such as air and water.	
Subj. + Verb + Object + Complement (adv.), for example, ...	Subj. + 把-construction [把 + object + verb + adv. phrase [得 (adv. marker) + adv.]], for example, ...	Subj. + 让/使-construction [让/使 + direct object + verb], such as, ...	
Noticing and awareness spotlight: Words/phrases used to give an example			
There are different phrases used to give an example. These phrases are usually set off with a comma.			
例如/譬如 (for example, for instance)			
像 (like, such as)			
举个例子来说 (to illustrate this)			
换句话说 (in other words, to put it another way)			
就是说 (that is to say)			
好像 似的 (just as/like... [used as simile])			

Learning Activity 3

Note: This activity is an expansion of Step 3 of “Part 2: Introduction” on pages 88-89 in the *EiE*[®] binder. It is designed to make connections to students’ prior knowledge and experience with the concept “constraint.”

1. Step 3, first bullet, page 88: “Do you remember the constraints on Juan Daniel’s design?” Review Juan Daniel’s motivation for designing a model membrane and the constraints on his model membrane design.
2. Write the word “constraints” on page 9 of MMIC 11-IWB. To help students understand the concept of “constraints,” make a connection with the rules for handling a soccer ball during a game. For example, one “constraint” is that soccer players (with the exception of the goalie) cannot use their hands to pass or catch the ball. The rules of the game “constrain” or “limit” some of the things the players can do; they tell you what you cannot do.
3. Invite students to share about other examples of a “constraint” (School rules? Other sports rules? Classroom rules? Dietary? Parents’ rules about finishing homework before playing?)
4. Have students turn to a partner and do a “Think, Pair, Share” activity to orally answer the following question:

中文	English
在 Juan Daniel 开始给青蛙设计薄膜模型的时候，他要想到的限制有哪些？	What constraints did Juan Daniel need to think about as he was designing his model membrane for his frog?

5. Ask pairs to find another pair and share their ideas again. Then ask four-member groups to share with the class one constraint or limiting factor that they discussed.
6. Step 3, second bullet, page 89: “If frog skin regulates water flow into and out of the frog, why must Juan Daniel build a model membrane to regulate water flow?” Discuss the lack of water on the soccer field and Juan Daniel’s desire to bring the frog to the Championship game.

Language Function-Form-Vocabulary Connections (Activity 3)		
CO LP 11.3.1	Identify a design constraint	
For example:		
Approaching	Attaining	Expanding
Juan Daniel 不可以给他的青蛙太多水。	Juan Daniel 的限制是他不可以给他的青蛙太多水。	在 Juan Daniel 开始给青蛙设计薄膜模型的时候, 他的限制是他不可以给他的青蛙太多水。
Juan Daniel cannot give his frog too much water.	Juan Daniel's constraint is (that) he cannot give his frog too much water.	As Juan Daniel begins to design his model membrane, his constraint is that he cannot give the frog too much water.
Subj. + negation + auxiliary + verb + pronoun + object ₁ + object complement (adverb + object ₂).	Noun phrase (Subj. + 的 + noun) + verb 是 + sentence phrase [Subj. + negation + auxiliary + verb + pronoun + object ₁ + object complement (adverb + object ₂)].	Noun phrase (Subj. + 的 + noun) + verb 是 + sentence phrase [Subj. + negation + auxiliary + verb + pronoun + object ₁ + object complement (adverb + object ₂)].
Form focus		
1. Use of dependent time phrase/clause in complex sentence		
<p>Mandarin uses prepositions as linking words to connect two clauses and form one complex sentence. When the first clause is dependent on the second clause to complete its meaning, prepositions will be placed at the end of the first clause. The first clause may consist of a time phrase [noun + preposition] (e.g., 在足球比赛的时候, During the soccer game) or a time clause with an adverb of time such as 正当的时候 (just when). For example, 正当他鼓足劲儿要出脚的时候, At the moment when he was about to kick the ball,...</p> <p>For example, Noun/simple SVO sentence + (以)后 (after), + main clause. Noun/simple SVO sentence + (以)前 (before), + main clause. Noun/simple SVO sentence + (正当)的时候 (when/while at), + main clause.</p>		
2. Auxiliary "helping verbs"		
<p>In Mandarin, auxiliary "helping verbs" indicate the ability, possibility, intention or desire to carry out an action. The following are examples of auxiliary "helping verbs": 会 'will likely + verb', 会 'will know + verb', 能/可以 'able to + verb', 要/应该 'ought to + verb', 要/想 'want to + verb', 可以 'allow to + verb', 不可以 'prohibited to + verb'.</p>		

3. How auxiliary “helping verbs” are same/different from other verbs
<p>Like other verbs, auxiliary verbs...</p> <ol style="list-style-type: none"> occur as the A element in A-not-A questions, for example, 薄膜的孔应该不应该很小? (Should the holes of a membrane be small?); can be negated, or example: 薄膜的孔不应该很大。 (The holes of a membrane should not be big.) <p>Unlike other verbs, auxiliary verbs ...</p> <ol style="list-style-type: none"> must co-occur with a verb or an assumed verb; For example, 薄膜的孔应该不应该很小? (Should the holes of a membrane be small?) does not take aspect markers such as 了(le), 过(guò), 着 zhe; cannot be modified by intensifiers, such as 很 (very) or 更 (even more); cannot be nominalized; cannot occur before the subject; cannot take a direct object.
Noticing and awareness spotlight
1. Use of “noun + 的 + noun” to express possession
To indicate ownership/possession, the structure is “noun + 的 + noun”, for example, Juan Daniel 的限制 means Juan Daniel’s constraint
2. 来 (lái) + verb phrase [verb + object], indicating purpose
Here, the verb 来 (lái) no longer functions as a verb meaning “to come/go”, rather it becomes a marker that takes on the meaning of “for the purpose of” and helps to connect two verbs. For example, 他只能用家里的材料来做薄膜模型。 He can just use the materials at home to make his Model Membrane.

CC LP 11.3.2	Negotiate to reach consensus	
For example:		
Approaching	Attaining	Expanding
好吧。 OK. 我同意。 I agree.	我同意你的想法。 I agree with your idea. 我也一样。 Same here.	不约而同。 We reach the consensus without consulting with each other.

Noticing and awareness spotlight: Use of 吗? 吧? 呢?

A few particles are commonly used at the end of questions.

吧? is used to invite agreement.

呢? is a tag question meaning “, and you?”

吗? is a question particle that is used when one expects a “yes” or “no” response.

CC LP 11.3.3	Express agreement/disagreement		
For example:			
Approaching	Attaining	Expanding	
好。 Good. 我同意。 I agree. 我也是 / 同意。 I also + verb (am/agree). 对。 Exactly/Correct.	你说得对。 You are correct. 你完全正确。 You're absolutely right. 我也是这么认为的。 I think so too. 我也不这么认为。 I don't think so either.	我的想法跟你的一样。 I share your thoughts. 我赞成。 I agree (more formal). 我完全赞同。 I agree with you entirely.	
不。 No. 不好。 Not good. 不同意。 I don't agree with you. 不对。 Not exactly.	我不是这么认为的。 I don't think so. 是, 可是你不觉得.....? Yes, but don't you think... 我觉得我不同意。 I'm afraid I have to disagree 。	我的意见跟你的不同。 My suggestions are different from yours. 我想和你讨论讨论..... I must take issue with you on that. 然而 However	
Noticing and awareness spotlight: Repetition of verb			
Repetition of a verb, e.g., 讨论讨论 (to discuss), can be used to soften the tone of voice.			

Learning Activity 4

Note: Activity 4 is an adaptation of Steps 4-10 of “Part 2: Introduction” on pages 88-90 in the *EiE*® binder. It is designed to increase students’ facility with the vocabulary that will be necessary for carrying out the experiment to test model membrane materials.

1. Steps 4, 5, 6: In lieu of steps 4, 5, and 6 on page 89 in the *EiE*® binder, engage students in the following series of activities:

Mystery Bag Activity:

- a. In this activity, student pairs will examine and describe the properties of the materials they could use to make their model membranes: 铝箔纸 (Aluminum foil: one sheet with one hole, another with two holes), 咖啡过滤纸 (coffee filter), 纱布 (cheesecloth), 毡布 (felt), 海绵 (sponge), and 尼龙纱窗布 (nylon screen).
- b. Place each of the 6 testing materials into twelve different mystery bags (paper lunch bags, each labeled with the number 1-12, with one material in each bag; there are 6 materials, so each material will be placed into two bags. The aluminum foil bags will have two sheets of aluminum foil: one sheet with one hole, another with two holes). Place the mystery bags in a circle around the periphery of the room.
- c. Distribute MMIC 11-2: *Model Membrane Materials Mystery Bag*, one per student.
- d. Talk through each of the columns on Handout 11-2 so that students are clear about what they are expected to do. Let students know that there are only six different materials, so some of the bags have the same kind of material. Ask them to write the numbers of both their bag and the bag with the same material in the “Bag #” column. Brainstorm possible vocabulary for the “properties” columns.
- e. Ask students to find a partner. Let them know that while they can work together each student is responsible for completing their own handout.
- f. Assign a mystery bag number (1-12), one to each pair of students as a place to begin the Mystery Bag exploration.

Note: Each pair will visit all twelve bags, one at a time. Ring a bell to let pairs know when it is time to move to the next mystery bag.

- g. As pairs visit each of the 12 mystery bags, they will feel what is inside, try to describe and draw the material, and guess what kind of testing material it is. Have them record their discoveries on the handout, Columns 1-4. Tell students that they can touch what is in the bag but they may not look inside or 偷看 (peek). Make sure students are aware that it is okay if they do not know the actual word for the material yet. Tell them that they can leave column 5 blank for now.
- h. Once partners have circulated around the room, explored each mystery bag and filled in the first four columns (Bag #, Material Properties, Membrane Properties, Drawing of

Material) on their individual handouts, have them find another pair and compare responses on the handout.

- i. Invite students to share some of their discoveries with the whole class.

Character Matching Activity:

- a. Display page 10 of MMIC 11-IWB and introduce the words for the pictures of all six testing materials: 铝箔纸 (aluminum foil), 咖啡过滤纸 (coffee filter), 纱布 (cheesecloth), 毡布 (felt), 海绵 (sponge), and 尼龙纱窗布 (nylon screen). Characters are listed to the right, but are not listed in order—they have a letter next to them for matching; pictures are numbered.
- b. Offer oral clues about the characters to help students make a match between the pictures and the characters. For example, because this material is ____, the matching character uses the radical for ____; or the right-hand part of the correct character for this object is the same as the right-hand part in the word for ____, etc. Here are some specific examples:

中文	English
<p>有人知道意思是“金属”的偏旁吗? (意思是“金属”的偏旁是钅。)</p> <p>看一看跟这些图片有关的所有的字,你发现了什么? (“铝”字的偏旁是“钅”)</p> <p>知道偏旁部首的意思能怎样帮助我们对应的图片和字词? (我们可以猜到这个字词大概跟金属有关系。)</p>	<p>Can anyone recall the semantic radical for “metal”? (The radical for “metal” is “钅.”)</p> <p>Look at all the words that correspond to these pictures. What do you notice? (“铝”’s radical is “钅”)</p> <p>How can knowing the meaning of a radical help us match a picture to a word? (We can guess that the word has some kind of relationship with “metal.”)</p>
<p>“尼龙”的发音是“nílóng”。它听起来像英文里的什么词? (Nylon)</p> <p>“咖啡”的发音是“kāfēi”。它听起来像英文里的什么词? (Coffee)</p> <p>知道字词的发音可以怎样帮助我们理解它的意思? (外来字词有时候按照它们的发音来写。)</p>	<p>The characters “尼龙” are pronounced “nílóng.” Does that sound like any word you know in English? (Nylon)</p> <p>The characters “咖啡” are pronounced “kāfēi.” Does that sound like any word you know in English? (Coffee)</p> <p>How can knowing the pronunciation of characters give us clues about a word’s meaning? (Words that come from other languages are sometimes written as they sound.)</p>

- c. Continue to fill in Column 5 (Material Name) of MMIC 11-2: *Model Membrane Materials Mystery Bag*, as students listen carefully to the clues and try to guess the match between these testing materials and their characters. Invite a student to make the match on the whiteboard and give their reasons for choosing one particular character. If everyone agrees, all students will write the character on their handout.
- d. Show students the contents of the mystery bags and ask students to make changes/additions to both “properties” columns for each of the materials on their handouts. Debrief what students have written, one material at a time.

Testing Materials Prediction Survey:

- a. Ask students to work individually to make a prediction about whether or not each of the materials they have just described will work well for designing a model membrane or not. Have them circle the words that match their prediction in the last column on MMIC 11-2: *Model Membrane Materials Mystery Bag*.
- b. When students have completed their predictions, divide the class into 4 groups with 7 members. Next, explain to students that groups will work together to discover the predictions made by their classmates.
- c. Distribute MMIC 11-3: *Model Membrane Materials Prediction Survey*. Let students know that for this next activity each group member will survey classmates about one of the seven testing materials: 有一个孔的铝箔纸 (Aluminum foil with one hole), 有两个孔的铝箔纸 (Aluminum foil with two holes), 咖啡过滤纸 (coffee filter), 纱布 (cheesecloth), 毡布 (felt), 海绵 (sponge), and 尼龙纱窗布 (nylon screen) to get their predictions on how well the material might work as part of a *model* membrane.
- d. Begin by asking students to talk in their groups to decide which of the seven materials each student in the group will survey classmates about. Have students write their names and the material they will ask classmates about on the survey handout. Once students have had time to do this, confirm with a show of hands that every group has identified one student for each of the seven materials.
- e. Invite students to help you construct a sample interaction about predictions so that they have the language needed for this next activity. Display the co-constructed sentence frame on page 11 of MMIC 11-IWB to refer to during this exchange. See sample below:

中文	English
<p>学生 A 你对_____的推测是什么? (有一个孔的铝箔纸、有两个孔的铝箔纸、咖啡过滤纸、纱布、毡布、海绵和尼龙纱窗布)</p>	<p>Student A What did you predict for ____ (aluminum foil with one hole; aluminum foil with two holes; cheesecloth; felt; a sponge; coffee filter; a nylon screen)?</p>
<p>学生 B 我推测_____可能管用/不管用。</p>	<p>Student B I predicted that ____ might work well/might not work well.</p>

<p>学生 A 为什么?</p> <p>学生 B 我推测_____可能管用/不管用, 因为它有_____。</p>	<p>Student A Why?</p> <p>Student B I predicted that it might work/not work well because it is/has _____.</p>
---	--

- f. Next, ask students to stand up and move to a more open space for this interactive activity. Instruct students to bring their handout (MMIC 11-3) and a pencil.
- g. Model a survey exchange before students begin. Remind students that they should only be speaking in Chinese as they talk to their classmates!
- h. Tell students that they are to interact with as many classmates as possible to learn about their predictions for the material that the group assigned to them. As they listen to their classmates' responses, students should keep a tally on the handout of how many classmates predicted that the sample material will work well **or** won't work well for designing a good model membrane. Encourage students to ask for reasons that support the predictions and to record these on the handout as well.

Note: Take digital photos as students engage in this interaction to use in future lessons to help students recall the steps that they took as they prepared to create their own model membranes.

- i. Give students 5-7 minutes to ask for a prediction from as many classmates as possible. Signal the end of the activity by flashing the lights or ringing a bell, etc.
 - j. Have students return to their 7-member groups. Ask them to report to their groups on what they learned about their material from the survey and prepare to share their findings with the whole class.
 - k. As a final step, survey the different groups' "survey" results on page 12 of MMIC 11-IWB (a copy of the MMIC 11-3). The class will look at these predictions again once the actual testing is completed, to see how well they had predicted which materials would work well/not well and why.
2. Steps 7-10: Continue with Steps 7-10 as written in the EiE® binder, page 90.

Language Function-Form-Vocabulary Connections (Activity 4)		
CO LP11.4.1	Describe attributes of something/someone using nominalization within a 是 ... 的 sentence structure	
Approaching	Attaining	Expanding
塑料做的(plastic-made) 钢筋做的(steel-made) 布做的(cloth-made) 毛做的 (hair-made) 木头做的(wood-made) 石头做的(stone-made) 竹子做的 (bamboo-made) 泥做的 (clay-made) 橡皮做的 (rubber-made) 人造的 (human-made) 天然的 (natural)	用塑料做的 made of plastic 用钢筋做的 made of steel 用布做的 made of cloth 用毛做的 made of hair 用木头做的 made of wood 用石头做的 made of stone 用竹子做的 made of bamboo 用泥做的 made of clay 用橡皮做的 made of rubber	咖啡滤纸所用的材料是..... The material that coffee filter uses is ...
茶叶袋是人造的。 The tea bag is human-made.	雨衣是用塑料做的。 The rain jacket is made of plastic.	咖啡滤纸所用的材料是纸做的。 The material that is used by a coffee filter is paper.
Subj. + predicate (verb 是 + adj. [noun + verb 做] + 的).	Subj + verb 是 + nominalization [verb phrase (用 + noun + verb 做) + 的]。	Relative clause [noun + particle 所 indicating passive voice + verb + 的] + head noun + predicate (verb 是 + adj. + 的).
Form focus		
1. Simple descriptive sentence (Subj. + 是 + adj. + 的)		
The “是 + adj. + 的” structure is commonly used to describe something or someone. For example, 这个物件是天然的。(This object is natural.)		
2. Nominalization using 的		
A verb/verb phrase can become a noun by placing the particle 的(de) after it. For example, the verb phrase 你说 (you say) can function as a noun phrase 你说的, meaning “what you say” in 你说的是 (What you say is...).		
<ul style="list-style-type: none"> If the subject is expressed in the verb phrase 你说 (you say), it is likely that the noun phrase,你说的 (what you say), will function as the direct object in the sentence, in this case, the “what” you say. If the direct object is expressed in the verb phrase, e.g., 种水果 (grow fruit), it is likely that the noun phrase, 种水果的, will function as the subject of the sentence, as that is the information that is lacking. 		

CO LP 11.4.2	Describe attributes of person/place/thing using modifying phrases		
For example: 有小孔的茶叶袋 (the tea bag that has tiny holes) 光亮的、保护食物的铝箔纸 (the aluminum foil that is shiny and protects food)			
Approaching	Attaining	Expanding	绿色的(green) 湿的(wet) 光亮的 (shiny) 厚厚的 (thick) 薄的 (thin) 白色的(white) 米色的(beige) 平滑的(smooth)
Attributive adjective [adj. + 的] + Head noun	Relative clause [(没)有 + noun + 的] + Head noun	让水通过的 (that allows water to pass through) 阻挡某些东西通过的 (that blocks some things from passing through) 有小得眼睛都看不见的孔 的 (that has holes that are too small to see)	
Form focus			1. Relative clause [verb + noun + 的] + Head noun
Modifying phrases can be either attributive adjectives, e.g., 薄的 (thin) or relative clauses, e.g., 有 (have) 小孔 (tiny holes) + 的 (that has tiny holes). Modifying phrases are placed in front of the head noun (e.g., 提供栖息地的热带雨林).			2. Use of particles 的、地、得
<p>的 (de) is used when an adjective and/or a pronoun modifies a noun. The form is: Adj./pron. + 的 + Noun, for example, 炎热的夏天 (sweltering summer), 我们的薄膜模型 (our model membrane design)</p> <p>地 (de) is used when an adverb modifies a verb. The form is: Adv. + 地 + Verb (unlike in English!), for example, 高兴地欢呼 (cheer happily)</p> <p>得 (de), as a potential complement, is used as a complement to further describe a main verb/adjective. It is placed after the verb/adjective it describes. The form is: Verb/adjective + 得 + degree complement</p>			

<p>The degree complement can be made up of an adverb or a noun phrase.</p> <p>For example,</p> <p>我跑得快。(I ran fast.) (得 + adverb as degree complement)</p> <p>薄膜有一些小得眼睛都看不见的孔。(Membranes have holes that are too small to see.) (得 + noun phrase as degree complement)</p>
Noticing and awareness spotlight
1. The negation of 有 (have) is 没有
<p>The negative particle 没 (méi), not 不 (bù), must be used to negate 有 (yǒu) [have]. 没 can be used by itself to express 没有 (méi yǒu). If 没 is used by itself, 有 is assumed such that 没 = 没有.</p>
2. Adjective repetition
<p>Adjective repetition occurs frequently in Chinese. There are different ways to do this:</p> <ol style="list-style-type: none"> “aa” form, e.g., 长长 (very long), 厚厚 (thick)、薄薄 (thin)*; “abb” form, e.g., 白皑皑 (snow-white, pure white, as very white as snow), 毛茸茸 or 毛茸茸 (hairy or downy), 亮晶晶 (glistening, sparkling, shining), 湿漉漉 (wet, moist); “aabb” form, e.g., 清清楚楚 (clear), 恍恍惚惚 (in a trance, absent-minded), 红红火火 (as very red/warm as fire). <p>* Use of double adjectives is typical for young children.</p>
3. The “monosyllabic” rule and use of 的
<p>When describing persons, places and things, the use of 的 between adj. and noun will occur if the adjective is made up of more than one syllable, for example, 两只有蹼的脚 (two webbed feet).</p> <p>However, use of 的 between the adjective and noun is omitted if the adjective is only one syllable. For example, 两只大眼睛 (two big eyes).</p>

CO LP 11.4.3	Use a developing understanding of basic units of word formation in Chinese to infer and construct meaning with written text
Form focus: radical → character → compound/word	
1. radical	
<p>A radical is the smallest meaningful orthographic unit in compound characters, for example, 虫 (insect) is used in the character 蛙 (frog). 虫 (insect) can also be a stand-alone character. There are three types of radicals: semantic (give information about character meaning) [手 (hand)], phonetic (give information about character pronunciation) [分 (fen) in the compound 纷 (one after another)], and perceptual (do not give information about character meaning or pronunciation, instead function as visual fillers) [此 (this, these in classical Chinese), however, in the compound 嘴 (mouth) the radical 此 functions as a perceptual radical providing information about neither meaning nor pronunciation].</p>	

2. character

A Chinese character is a meaningful orthographic unit that is always pronounced as one syllable. Chinese characters have evolved as a writing system over millennia and have developed in various ways.

Some characters are **pictographs** that were originally drawings of concrete objects, for example, 雨 (rain), the four dots depicting the rain coming down from the sky; others are better described as **ideographs** because they were created as graphic representations of more abstract ideas such as the notion of “above”, 上, the stroke above the horizontal line indicating the idea of “above” or “up.” Another way to create characters was to combine two or more pictographs or ideographs to portray a new meaning, for example, 休 (to rest), a combination of the pictographs for person, 人, and a person leaning against a tree, 木. These types of characters are referred to as **ideogrammatic characters**.

Over 90% of Chinese characters were created as **phono-semantic compound characters** and are made up of a combination of semantic and phonetic radicals. For example, 控 (to control), the semantic radical on the left side, 手 (hand), indicates that the word meaning will include an action with a hand, and the phonetic radical on the right side 空 (kōng), helps the reader with character pronunciation “kòng.”

3. compound

Compounds consist of at least two characters, neither of which is an affix, a character that on its own lacks meaning but when added to other characters becomes a meaningful unit. Most Chinese words are compounds. Compounds have various types of syntactic relationships.

A few compound types:

Verb-Object: 踢足球 (to kick soccer ball)、开球 (to kick of)、发誓 (to pledge)

Verb-Complement: 摔倒 (to fall down)、改进 (to improve and get better)、进来 (to come in)

Subject-Predicate: 天亮 (bright [sky is bright])

Number-Classifier: 各种 (various kinds)、一道 (a ray of...)、一片 (a patch of...)





Adverb-Verb: 慢跑 (to jog [to run slowly])、快走 (to hurry [to walk fast])

Verb-Verb-Noun: 栖息地 (habitat [to stay and rest at a place])

Adjective-Adjective-Noun: 浅桃色 (light peach color)、吉祥物 (mascot [happy and auspicious object])

4. word

A word is written with one or more Chinese characters. A word can consist of a single character (脚, foot), a compound (幸运, lucky), a duplicate (招招手, to wave), or an affixed form (第一, first, 第二, second, etc.).

CO LP 11.4.4	Construct characters to form words and phrases adhering to character structure rules and stroke order guidelines		
For example: Left-right: 叫、场 Top-bottom: 吉、只 Left, middle, right: 树、谁 Top, middle, bottom: 复、常 One-part, totally enclosed: 国、回 Partially enclosed: 用, 原			
Approaching	Attaining	Expanding	
One- and two-part characters One-part character 我、生 One-part, totally enclosed 国、回 Two-part characters Left-right: 叫、场 Top-bottom: 吉、只	Three-part characters Left, middle, right: 树、谁 Top, middle, bottom: 复、常 Left, top-right, bottom-right: 锋、纷 Top-left, bottom-left, right: 部、剂、劲 Left-top, right-top, bottom: 然、赞 Top, left-bottom, right-top: 死、前	Four + part characters Left-top, right-top, left-bottom, right bottom: 能、舒 Left, top-right, middle-right, bottom-right: 慢、镜 Left, middle, top-right, bottom-right: 游 Left, middle-top, middle-bottom, right: 湖	
Form focus: Formation of Chinese characters			
1. Character structure rules			
<p>Chinese characters are called “square” characters because no matter how simple or complex, each character fits inside a square. Characters can usually be divided into different parts. These parts form character structures. There are four main structures: one-part structure, two-part structure, three-part structure, and four-part structure. These structures can be further divided into sub-parts.</p> <p>For example,</p> <p>Two-part structures:  (top/bottom),  (left/right)</p> <p>Three-part structures:  (left, top-right, bottom-right),  (top-left, bottom-left, right), etc.</p>			

2. Stroke order guidelines	
General rules for writing Chinese characters are:	
<ol style="list-style-type: none"> 1. Horizontal first, then vertical. 2. Top first, then bottom. 3. Left first, then right. 4. Left-slanted first, then right-slanted. 5. Outside first, then inside. 6. Center first, then both sides. 7. With “closed” characters, enter character first, then close it up. 	

CO LP 11.4.5	Predict degree of probability of something using auxiliary “helping” verbs		
For example:			
	Approaching	Attaining	Expanding
	我想海绵可能管用。 I think a sponge is likely to work well.	我觉得／想海绵应该(不)管用。 I feel like/think that a sponge ought to (not) work well.	[根]据我的观察，我觉得／想海绵在我们的薄膜模型中应该管用。 Due to my observations, I think a sponge could work well in our model membrane design.
	Use of adverb “可能” to express future possibility.	Use of auxiliary 应该 + adjectival verb 管用.	Use of adverb of time phrase, subj. + verb + object complement (object + 在+ locative phrase + auxiliary 应该 + adjectival verb 管用).
Form focus			
1. Auxiliary “helping verbs”			
In Mandarin, auxiliary “helping verbs” indicate the ability, possibility, intention or desire to carry out an action. The following are examples of auxiliary “helping verbs”: 会 ‘will likely + verb’, 会 ‘will know + verb’, 能/可以 ‘able to + verb’, 要/应该 ‘ought to + verb’, 要/想 ‘want to + verb’, 可以 ‘allow to + verb’, 不可以 ‘prohibited to + verb’			
2. How auxiliary “helping verbs” are same/different from other verbs			
Like other verbs, auxiliary verbs...			
a. occur as the A element in A-not-A questions, for example, 薄膜的孔应该不应该很小? (Should the holes of a membrane be small?);			

- b. can be negated, or example: 薄膜的孔不应该很大。(The holes of a membrane should not be big.)

Unlike other verbs, auxiliary verbs ...

- must co-occur with a verb or an assumed verb;
For example, 薄膜的孔应该不应该很小? (Should the holes of a membrane be small?)
- does not take aspect markers such as 了(le), 过(guò), 着 zhe;
- cannot be modified by intensifiers, such as 很 (very) or 更 (even more);
- cannot be nominalized;
- cannot occur before the subject;
- cannot take a direct object.

Noticing and awareness spotlight: Placement of locative phrase

Unlike in English, a locative phrase is placed either at the beginning of the sentence or before the main verb, NOT at the end of the sentence.

A locative phrase, e.g., “在 zai + concrete noun +locative particle,” can be placed in a sentence as follows:

- Directly before the main verb. (typical placement)
我觉得／想海绵在我们的薄膜模型中应该管用。
I think a sponge could work well in our model membrane design.
(Subj. + verb + object complement (object + 在+ locative phrase + auxiliary 应该 + adjectival verb 管用).
- At the beginning of the sentence and set off by a comma. (for emphasis)
在咖啡过滤纸上, 我们放了一块海绵。On the coffee filter, we put a sponge.
(Locative phrase, subj + verb + past tense marker + object.)
- After main verb in a 把-construction (giving emphasis to the direct object)
我们把一块海绵放在咖啡过滤纸上了。We placed a sponge on the coffee filter.
(Subj + 把-construction [把 + object + verb + complement] + past tense marker.)

CC LP 11.4.6	Support ideas/opinions using compound sentences with adverb 因此	
For example:		
Approaching	Attaining	Expanding
我们猜测....., 因为它有.....	毡布有孔, 因此, 我们猜测.....	由于尼龙纱窗布上有很多小孔, 因此, 我们猜测.....
We predict...., because it has ...	Felt has holes, as a result, we predict...	Due to the many tiny holes on the nylon screen, as a result, we predict.....
....., 因为 (because)....., 因此 (as a result, therefore),	由于 (due to)....., 因此 (as a result, therefore),

Form focus:, 因此 (as a result, therefore),
因此 (as a result, therefore) is an adverb that can be used instead of the conjunction 因为 in the second clause.
Noticing and awareness spotlight: Use of 由于 (due to)
由于 (due to)....., reflects a more formal register and is more likely to be used in written communication.

CC LP 11.4.7	Make inferences based on visual clues	
For example:		
Approaching	Attaining	Expanding
我猜/想 I guess /think 也许/可能..... Maybe/ Perhaps... 在我看来..... It seems to me that .../In my opinion, ...	我敢肯定..... I bet that... 告诉我们..... ...tells us that...	我估计/推断/猜测..... I expect/deduce/suppose that ... 似乎..... It seems as if... 从我们的观察中可以知道 As is noted in our observations...

CC LP 11.4.8	Express agreement/disagreement	
For example:		
Approaching	Attaining	Expanding
好。 Good. 我同意。 I agree. 我也是/同意。 I also + verb (am/agree). 对。 Exactly/Correct.	你说得对。 You are correct. 你完全正确。 You're absolutely right. 我也是这么认为的。 I think so too. 我也不这么认为。 I don't think so either.	我的想法跟你的一样。 I share your thoughts. 我赞成。 I agree (more formal). 我完全赞同。 I agree with you entirely.

<p>不。 No.</p> <p>不好。 Not good.</p> <p>不同意。 I don't agree with you.</p> <p>不对。 Not exactly.</p>	<p>我不是这么认为的。 I don't think so.</p> <p>是，可是你不觉得.....? Yes, but don't you think...</p> <p>我觉得我不同意。 I'm afraid I have to disagree.</p>	<p>我的意见跟你的不同。 My suggestions are different from yours.</p> <p>我想和你讨论讨论..... I must take issue with you on that.</p> <p>然而 However</p>
Noticing and awareness spotlight: Repetition of verb		
Repetition of a verb, e.g., 讨论讨论 (to discuss), can be used to soften the tone of voice.		

Focused Learning Phase-- “Through” activities

Students will test materials in preparation for designing their own model membranes.

Time: Learning Activity 5— 45 minutes
Learning Activity 6— 20 minutes

Learning Activity 5

Note: Take digital photos of the material testing activity so that you can use them in future lessons to help students recall the steps that they took as they created their own model membrane designs. Make sure there is one good photo of student “scientists” working with each of the six model membrane materials.

1. Divide the class into working groups of 4.
2. Display page 13 of MMIC 11-IWB and assign roles to each student in the group using laminated job cards:

Chinese Champion (中文督察员) + Polished Presenter (演示质检员)

- Encourages use of Chinese only
- Assists group members with correct word/phrase as needed
- Reports group’s work to class

Remarkable Recorder (记录员)

- Writes group responses

Magnificent Materials Manager (材料管理员)

- Picks up and distributes handouts and materials to group
- Places the testing materials into the cup

Terrific Taskmaster (工作管理员)

- Makes sure group manages time/task well
- Leads group from step to step
- Pours the water onto each of the materials tested

3. Ask the 材料管理员 (**Magnificent Materials Manager**) to pick up handout MMIC 11-4 (EiE® {3-3}): *Testing Model Membrane Materials* for their group.
4. Before beginning the experiment, model for students how they should place materials into the cup and how they should pour the water to test each material. Display MMIC 11-4 (EiE® {3-3}): *Testing Model Membrane Materials* on the whiteboard. Model for students how the 记录员 (**Remarkable Recorder**) will record the group’s findings onto the handout as they test the materials. Instruct students to leave the last column blank for now; they will complete their “observations” after having finished the experiment.
5. Follow the steps for “Part 2: Activity” on pages 91-92 of the EiE® binder.

Language Function-Form-Vocabulary Connections (Activity 5)		
CO LP 11.5.1	State quantities of materials using numbers and appropriate classifiers	
For example: 一张铝箔纸 (a piece of aluminum foil) 五张咖啡过滤纸 (five coffee filters) 三块纱布 (three pieces of cheesecloth) 两块海绵 (two sponges)		
Approaching	Attaining	Expanding
个 (gè) people and general object 家 (jiā) families and business establishments 件 (jiàn) clothing 棵 (kē) plants 只 (zhī) insects and animals 支 (zhī) rod-shaped objects, e.g., pencil, Chinese paint brush 把 (bǎ) small objects and objects with a handle, e.g., scissors, chair 本 (běn) journals, books and files	张 (zhāng) thin and flat objects, e.g., aluminum foil, coffee filter 块 (kuài) pieces of small things, e.g., felt, sponge 位 (wèi) persons of status, e.g., professor, engineer 碗 (wǎn) things that come in bowls mostly, e.g., noodles, rice, water 场 (chǎng) events and happenings such as episode, e.g., soccer game	滴 (dī) a drop/a drip used for liquid items 对 (duì) couple/pair: modifies anything that comes in pairs 架 (jià) planes and large vehicles and a few smaller electric objects such as radios
Form focus: Number + Classifier + Object (noun)		
Classifiers are used when counting objects (nouns). Almost all nouns have a corresponding classifier. When learning a noun it is always good to learn its classifier.		
Noticing and awareness spotlight		
1. The difference between 二 and 两		
二	两	
1) Counting: e.g., 一、二、三..... 2) Used in ordinal numbers: e.g., 第一 (first)、第二 (second)、第三 (third) 3) As last part of any higher number that ends in two: e.g., 十二 (12)、八十二 (82)	Used whenever a classifier is used to indicate “two of something”, see: Subj. + Verb + 两 + Classifier + Noun	

2. The difference between 只 and 支	
只 (zhī)	支 (zhī)
只 is used for insects and animals.	支 is used for rod-shaped objects.
These two classifiers are homophones. They have the same pronunciation but different uses and meanings.	

CC LP 11.5.2	Make a request using different degrees of politeness		
Approaching	Attaining	Expanding	
我们需要两张咖啡滤纸。 We need two coffee filters. 我们要两张咖啡滤纸。 We want two coffee filters.	请给我们两张咖啡滤纸。 Please give us two coffee filters.	麻烦您给我们两张咖啡滤纸。 Would you give us please?	

Learning Activity 6

1. Display page 14 of MMIC 11-IWB, MMIC 11-4 (EiE® {3-3}): *Testing Model Membrane Materials*.
2. Ask students (in the same working groups of 4) to complete the “observations” column (the last column on the handout) and to compare their results with their individual and whole class predictions that they made earlier (MMIC 11-2 and 11-3). How did they do? Any surprises? Display the following sentence frames on page 15 of MMIC 11-IWB for students to use as they discuss and record their observations in their groups. Have them use the properties that are listed on MMIC 11-2: *Model Membrane Materials Mystery Bag* when they describe why the materials worked well or did not work well; this will give them the vocabulary that they need.

中文	English
我/我们猜_____在薄膜模型里可能管用/不管用，因为它/它有..... 我们的推测是对的。	I/We guessed that ___ might work well / might not work well in a model membrane because it is... / it has.... Our prediction was correct.
我/我们猜_____在薄膜模型里可能管用/不管用。然而，经过实验，我/我们发现_____管用/不管用，因为它/它有.....	I/We guessed that _____ might work well / might not work well in a model membrane. However, after testing it, I/we learned that it might /might not work well because it is... / it has...

3. Invite 演示质检员 (**Polished Presenters**) to orally report their group’s findings to the whole class, using the sentence frames displayed on the whiteboard.
4. Ask groups to keep their handouts to use as a reference for information as they plan and create their model membranes.

Expansion Phase--“Beyond” activities

Students record their observations from the materials testing activity in their science notebooks.

Time: Learning Activity 7—20 minutes

1. Have students take out their science notebooks.
2. Ask them to write a summary of their observations from the testing materials activity in their science notebooks, noting which materials they think might work well as a model membrane. Have them use a similar sentence frame to the one that they used to orally communicate their observations during Learning Activity 6, #2. Instruct students to write one sentence for each of the materials that they think might work well:

中文	English
我/我们猜_____在薄膜模型里可能管用/不管用，因为它/它有.....	We think that ___ might work/might not work well in a model membrane because it is ___ / it has ___.

Collect science notebooks to check for student comprehension.

Language Function-Form-Vocabulary Connections (Activity 6-7)		
CO LP 11.6-7.1	Recount events in simple past time using action verbs with 了 (temporal marker) and dependent time phrase/clause in complex sentence	
For example:		
Approaching	Attaining	Expanding
我们发现了.....不管用。	当我们测试尼龙纱窗布的时候，我们看见了水穿过得很快。	经过测试有一个孔的铝箔纸后，我/我们发现了水流得很快。
We found ... did not work well.	When we tested the nylon screen, we saw that water passed through it quickly.	After testing the aluminum foil with one hole, I/we found that it made the water flow slowly.
Simple past time using action verb with temporal marker 了	Use of dependent time phrase in complex sentence and temporal marker 了	Use of dependent time clause in complex sentence and temporal marker 了
Form focus		
1. Use of 了 as temporal marker		
Simple past time can be communicated using 了 (temporal marker), e.g., action verb + 了 (temporal marker). The temporal marker “了” is positioned either immediately after the main verb or at the end of the sentence/clause.		
2. Use of dependent time phrase/clause in complex sentence		
Mandarin uses prepositions as linking words to connect two clauses and form one complex sentence. When the first clause is dependent on the second clause to complete its meaning, prepositions will be placed at the end of the first clause. The first clause may consist of a time phrase [noun + preposition] (e.g., 足球比赛的时候,) or a time clause [simple SVO sentence + preposition] (e.g., 当我们测试尼龙纱窗布的时候,).		
For example, Noun/simple SVO sentence + 以后 (after), + main clause. Noun/simple SVO sentence + 以前 (before), + main clause. Noun/simple SVO sentence + 的时候 (when/while at), + main clause.		
Noticing and awareness spotlight		
1. Use of temporal marker “了” with “verb + verb complement” structure		
When a two-character “verb + verb complement” structure is used, the temporal marker “了” must be placed after the verb complement.		

For example,
[我] 看到了。(I saw.)

However, if the verb complement consists of two characters instead of just one, then “了” can be placed either after the one-character first main verb or after the two-character verb complement.

For example,
他走了出来。(He walked out of there.)
他走出来了。(He walked out of there.)

2. Use of particles 的、地、得

的 (de) is used when an adjective and/or a pronoun modifies a noun. The form is:
Adj./pron. + 的 + Noun, for example, 炎热的夏天 (sweltering summer), 我们的薄膜模型 (our model membrane design)

地 (de) is used when an adverb modifies a verb. The form is:
Adv. + 地 + Verb (unlike in English!), for example, 高兴地欢呼 (cheer happily)

得 (de), as a potential complement, is used as a complement to further describe a main verb/adjective. It is placed after the verb/adjective it describes. The form is:
Verb/adjective + 得 + degree complement





The degree complement can be made up of an adverb or a noun phrase.

For example,
我跑得快。(I ran fast.) (得 + adverb as degree complement)
薄膜有一些小得眼睛都看不见的孔。(Membranes have holes that are too small to see.) (得 + noun phrase as degree complement)

CO LP 11.6-7.2	Predict degree of probability of something using auxiliary “helping” verbs		
For example:			
	Approaching	Attaining	Expanding
我想海绵可能管用。 I think a sponge is likely to work well.	我觉得／想海绵应该(不)管用。 I feel like/think that a sponge ought to (not) work well.	[根]据我的观察，我觉得／想海绵在我们的薄膜模型中应该管用。 Due to my observations, I think a sponge could work well in our model membrane design.	

Use of adverb “可能” to express future possibility.	Use of auxiliary 应该 + adjectival verb 管用.	Use of adverb of time phrase, subj. + verb + object complement (object + 在+ locative phrase + auxiliary 应该 + adjectival verb 管用).
Form focus		
1. Auxiliary “helping verbs”		
<p>In Mandarin, auxiliary “helping verbs” indicate the ability, possibility, intention or desire to carry out an action. The following are examples of auxiliary “helping verbs”: 会 ‘will likely + verb’, 会 ‘will know + verb’, 能/可以 ‘able to + verb’, 要/应该 ‘ought to + verb’, 要/想 ‘want to + verb’, 可以 ‘allow to + verb’, 不可以 ‘prohibited to + verb’</p>		
2. How auxiliary “helping verbs” are same/different from other verbs		
<p>Like other verbs, auxiliary verbs...</p> <ol style="list-style-type: none"> occur as the A element in A-not-A questions, for example, 薄膜的孔应该不应该很小? (Should the holes of a membrane be small?); can be negated, or example: 薄膜的孔不应该很大。 (The holes of a membrane should not be big.) <p>Unlike other verbs, auxiliary verbs ...</p> <ol style="list-style-type: none"> must co-occur with a verb or an assumed verb; For example, 薄膜的孔应该不应该很小? (Should the holes of a membrane be small?) does not take aspect markers such as 了(le), 过(guò), 着 zhe; cannot be modified by intensifiers, such as 很 (very) or 更 (even more); cannot be nominalized; cannot occur before the subject; cannot take a direct object. 		
Noticing and awareness spotlight: Placement of locative phrase		
<p>Unlike in English, a locative phrase is placed either at the beginning of the sentence or before the main verb, NOT at the end of the sentence.</p> <p>A locative phrase, e.g., “在 zai + concrete noun +locative particle,” can be placed in a sentence as follows:</p> <ol style="list-style-type: none"> Directly before the main verb. (typical placement) 我觉得/想海绵在我们的薄膜模型中应该 管用。 I think a sponge could work well in our model membrane design. (Subj. + verb + object complement (object + 在+ locative phrase + auxiliary 应该 + adjectival verb 管用). At the beginning of the sentence and set off by a comma. (for emphasis) 在咖啡过滤纸上, 我们放了一块海绵。 On the coffee filter, we put a sponge. (Locative phrase, subj + verb + past tense marker + object.) 		

6. After main verb in a 把-construction (giving emphasis to the direct object)
 我们把一块海绵放在咖啡过滤纸上了。 We placed a sponge on the coffee filter.
 (Subj + 把-construction [把 + object + verb + complement] + past tense marker.)

CO LP 11.6-7.3		Construct characters to form words and phrases adhering to character structure rules and stroke order guidelines	
For example: Left-right: 叫、场 Top-bottom: 吉、只 Left, middle, right: 树、谁 Top, middle, bottom: 复、常 One-part, totally enclosed: 国、回 Partially enclosed: 用, 原			
Approaching		Attaining	
Expanding			
One- and two-part characters		Three-part characters	
One-part character 我、生 One-part, totally enclosed 国、回 Two-part characters Left-right: 叫、场 Top-bottom: 吉、只		Left, middle, right: 树、谁 Top, middle, bottom: 复、常 Left, top-right, bottom-right: 锋、纷 Top-left, bottom-left, right: 部、剂、劲 Left-top, right-top, bottom: 然、赞 Top, left-bottom, right-top: 死、前	
		Four + part characters	
		Left-top, right-top, left-bottom, right bottom: 能、舒 Left, top-right, middle-right, bottom-right: 慢、镜 Left, middle, top-right, bottom-right: 游 Left, middle-top, middle-bottom, right: 湖	
Form focus: Formation of Chinese characters			
1. Character structure rules			
Chinese characters are called “square” characters because no matter how simple or complex, each character fits inside a square. Characters can usually be divided into different parts. These parts form character structures. There are four main structures: one-part structure, two-part structure, three-part structure, and four-part structure. These structures can be further divided into sub-parts. For example,			
Two-part structures:  (top/bottom),  (left/right)			
Three-part structures:  (left, top-right, bottom-right),  (top-left, bottom-left, right), etc.			

General rules for writing Chinese characters are:

1. Horizontal first, then vertical.
2. Top first, then bottom.
3. Left first, then right.
4. Left-slanted first, then right-slanted.
5. Outside first, then inside.
6. Center first, then both sides.
7. With “closed” characters, enter character first, then close it up.

CO LP 11.6-7.4	Use a developing understanding of basic units of word formation in Chinese to infer and construct meaning with written text
Form focus: radical → character → compound/word	
1. radical	
<p>A radical is the smallest meaningful orthographic unit in compound characters, for example, 虫 (insect) is used in the character 蛙 (frog). 虫 (insect) can also be a stand-alone character. There are three types of radicals: semantic (give information about character meaning) [手 (hand)], phonetic (give information about character pronunciation) [分 (fen) in the compound 纷 (one after another)], and perceptual (do not give information about character meaning or pronunciation, instead function as visual fillers) [此 (this, these in classical Chinese), however, in the compound 嘴 (mouth) the radical 此 functions as a perceptual radical providing information about neither meaning nor pronunciation].</p>	
2. character	
<p>A Chinese character is a meaningful orthographic unit that is always pronounced as one syllable. Chinese characters have evolved as a writing system over millennia and have developed in various ways.</p> <p>Some characters are pictographs that were originally drawings of concrete objects, for example, 雨 (rain), the four dots depicting the rain coming down from the sky; others are better described as ideographs because they were created as graphic representations of more abstract ideas such as the notion of “above”, 上, the stroke above the horizontal line indicating the idea of “above” or “up.” Another way to create characters was to combine two or more pictographs or ideographs to portray a new meaning, for example, 休 (to rest), a combination of the pictographs for person, 人, and a person leaning against a tree, 木. These types of characters are referred to as ideogrammatic characters.</p> <p>Over 90% of Chinese characters were created as phono-semantic compound characters and are made up of a combination of semantic and phonetic radicals. For example, 控 (to control), the semantic radical on the left side, 手 (hand), indicates that the word meaning will include an action with a hand, and the phonetic radical on the right side 空 (kōng), helps the reader with character pronunciation “kòng.”</p>	

3. compound
<p>Compounds consist of at least two characters, neither of which is an affix, a character that on its own lacks meaning but when added to other characters becomes a meaningful unit. Most Chinese words are compounds. Compounds have various types of syntactic relationships.</p> <p>A few compound types:</p> <p><i>Verb-Object</i>: 踢足球 (to kick soccer ball)、开球 (to kick of)、发誓 (to pledge)</p> <p><i>Verb-Complement</i>: 摔倒 (to fall down)、改进 (to improve and get better)、进来 (to come in)</p> <p><i>Subject-Predicate</i>: 天亮 (bright [sky is bright])</p> <p><i>Number-Classifier</i>: 各种 (various kinds)、一道 (a ray of...)、一片 (a patch of...)</p> <p><i>Adverb-Verb</i>: 慢跑 (to jog [to run slowly])、快走 (to hurry [to walk fast])</p> <p><i>Verb-Verb-Noun</i>: 栖息地 (habitat [to stay and rest at a place])</p> <p><i>Adjective-Adjective-Noun</i>: 浅桃色 (light peach color)、吉祥物 (mascot [happy and auspicious object])</p>
4. word
<p>A word is written with one or more Chinese characters. A word can consist of a single character (脚, foot), a compound (幸运, lucky), a duplicate (招招手, to wave), or an affixed form (第一, first, 第二, second, etc.).</p>

CC LP 11.6-7.5	Make inferences based on visual clues	
For example:		
Approaching	Attaining	Expanding
我猜/想 I guess /think 也许/可能..... Maybe/ Perhaps... 在我看来..... It seems to me that .../In my opinion, ...	我敢肯定..... I bet that... 告诉我们..... ...tells us that...	我估计/推断/猜测..... I expect/deduce/suppose that ... 似乎..... It seems as if... 从我们的观察中可以知道 As is noted in our observations...

CC LP 11.6-7.6	Express agreement/disagreement	
For example:		
Approaching	Attaining	Expanding
好。 Good. 我同意。 I agree. 我也是 / 同意。 I also + verb (am/agree). 对。 Exactly/Correct.	你说得对。 You are correct. 你完全正确。 You're absolutely right. 我也是这么认为的。 I think so too. 我也不这么认为。 I don't think so either.	我的想法跟你的一样。 I share your thoughts. 我赞成。 I agree (more formal). 我完全赞同。 I agree with you entirely.
不。 No. 不好。 Not good. 不同意。 I don't agree with you. 不对。 Not exactly.	我不是这么认为的。 I don't think so. 是，可是你不觉得.....? Yes, but don't you think... 我觉得我不同意。 I'm afraid I have to disagree 。	我的意见跟你的不同。 My suggestions are different from yours. 我想和你讨论讨论..... I must take issue with you on that. 然而 However
Noticing and awareness spotlight		
1.Repetition of verb		
Repetition of a verb, e.g., 讨论讨论 (to discuss), can be used to soften the tone of voice.		

CC LP 11.6-7.7	Support ideas/opinions using compound sentences with adverb 因此	
For example:		
Approaching	Attaining	Expanding
海绵是不管用的，因为它太厚了。	海绵太厚了，水不能通过，因此，我们认为海绵是不管用的。	由于毡布不能让水一滴一滴地滴下来，因此，我们认为毡布是不管用的。
The sponge does not work well, because it is too thick.	The sponge is too thick and it does not allow water to pass through, as a result, we think a sponge does not work well.	Due to the fact that the felt cannot let water drip through, as a result, we think it does not work well.
....., 因为 (because)..... 因为 (because)....., 所以 (so)....., 因此 (as a result, therefore),	由于 (due to)....., 因此 (as a result, therefore),
Form focus:, 因此 (as a result, therefore),		
因此 (as a result, therefore) is an adverb that can be used instead of the conjunction 因为 in the second clause.		
Noticing and awareness spotlight		
1. Use of 由于 (due to)		
由于 (due to)....., reflects a more formal register and is more likely to be used in written communication.		
2. Simple descriptive sentence (Subj. + 是 + adj. +的)		
The “是 + adj. +的” structure is commonly used to describe something or someone. For example, 海绵是不管用的。(The sponge does not work.)		

Evidence of learning

- Completed handouts:
 - MMIC 11-1: *Frayer Model® Concept Map*
 - Venn Diagram or Double-Bubble map
 - MMIC 11-2: *Model Membrane Materials Mystery Bag*
 - MMIC 11-3: *Model Membrane Materials Prediction Survey*
 - MMIC 11-4 (EiE® {3-3}): *Testing Model Membrane Materials*
- Correct matches of testing materials to their characters
- Completed science notebook entry

Vocabulary List

Content-obligatory (CO)

了解 Recognize			
Pīnyīn	Characters	English meaning	Parts of speech
bó mó mó xíng de tè xìng	薄膜模型的特性	properties of model membrane	noun phrase
cái liào de tè xìng	材料的特性	properties of materials	noun phrase
cái liào míng chēng	材料名称	material name	noun
fǔ zhù gài niàn	辅助概念	supporting ideas	noun
hǎi mián	海绵	sponge	noun
jié yuē/jié shěng	节约/节省	save	verb
kā fēi guò lǜ zhǐ	咖啡过滤纸	coffee filter	noun
kē xué rì zhì	科学日志	science notebook/journal	noun
liú sù	流速	rate of flow	noun
lǚ bó zhǐ	铝箔纸	aluminum foil	noun
néng gòu kòng zhì liú sù	能够控制流速	to be able to control rate of flow	verbal phrase
ní lóng shā chuāng bù	尼龙纱窗布	nylon screen	noun
quē fá	缺乏	scarcity	verb
shā bù	纱布	cheesecloth	noun
shǎn liàng	闪亮	shiny	adjective
shuǐ liàng	水量	amount of water	noun
xiàn zhì	限制	constraint	noun
yǒu liǎng gè kǒng de lǚ bó zhǐ	有两个孔的铝箔纸	aluminum foil with two holes	noun phrase
yǒu yí gè kǒng de lǚ bó zhǐ	有一个孔的铝箔纸	aluminum foil with one hole	noun phrase
zhān bù	毡布	felt	noun
识记 Produce			
Pīnyīn	Characters	English meaning	Parts of speech
bái sè de/mǐ sè de	白色的/米色的	white/beige	adjective
bǎo hù	保护	to protect	verb
bó de	薄的	thin	adjective
bó mó	薄膜	membrane	noun
bù fèn	部分	some	pronoun

bù zhòu	步骤	step	noun
chuān guò/tōng guò	穿过/通过	pass through	verb
gǎi jìn	改进	improve	verbal phrase
gōng chéng shè jì bù zhòu	工程设计步骤	Engineering Design Process	noun
gōng chéng shī	工程师	engineer	noun
hòu	厚	thick	adjective
kā fēi guò lǜ zhǐ	咖啡过滤纸	coffee filter	noun
Kě nǎng bù guǎn yòng	可能不管用	might not work	verbal phrase
Kě nǎng guǎn yòng	可能管用	might work	verbal phrase
kē xué jiā	科学家	scientist	noun
kuài	快	fast	adjective
liú guò	流过	to flow through	verb
màn	慢	slow	adjective
méi yǒu	没有	none	pronoun
méi yǒu kǒng	没有孔	does not have holes	verb
méi yǒu yòng/bù guǎn yòng	没有用/不管用	does not work well	verbal phrase
mó xíng	模型	to model/modeling	verb
píng huá	平滑	smooth	adjective
qù jiě jué shí jì wèn tí	去解决实际问题	to solve real-world problems	verbal phrase
quán bù	全部	all	pronoun
shè jì	设计	to design	verb
shè jì	设计	plan	verbal phrase
shí yàn	实验	experiment	verb/noun
shì yí shì xīn de xiǎng fǎ	试一试新的想法	to try out new ideas	verbal phrase
sī kǎo	思考	imagine	verbal phrase
tí wèn	提问	ask	verbal phrase
tiān rán de bó mó	天热的薄膜	natural membrane	noun phrase
tuī cè	推测	to predict/prediction	verb/noun
yǒu dòng/yǒu kǒng	有洞/有孔	has holes	verb
yǒu yòng/guǎn yòng	有用/管用	works well	verbal phrase
yùn yòng xiǎng xiàng lì	运用想象力	to use imagination	verbal phrase
zhì zuò	制作	create	verbal phrase

zhǐ zuò de	纸做的	made of paper	adjective
zhōng	中	medium	adjective
zǔ dǎng	阻挡	block	verb

Content-compatible (CC)

了解 Recognize			
Pīnyīn	Characters	English meaning	Parts of speech
bǎo	保	plastic wrap	noun
bō li	玻璃	glass	noun
dìng yì	定义	definition	noun
gōng néng	功能	function	noun
hé lí zuò de bà	河狸做的坝	beaver dam	noun phrase
huà tú	画图	to draw a picture	verb
jí zhōng zhì huì	集中智慧	to brainstorm	verb
lòu sháo	漏杓	noodle strainer	noun
qiáo tú	桥图	Bridge Map	noun
quān chū	圈出	to circle	verb
shuāng pào pào tú	双泡泡图	Double Bubble Map	noun
shuǐ bà	水坝	dam	noun
tè xìng	特性	property	noun
tǐ xiàn	体现	to represent	verb
tōu kàn	偷看	to peek	verb
wà zi	袜子	sock	noun
wéi ēn tú	维恩图	Venn Diagram	noun
wèn juàn	问卷	survey	noun
xiàng dà zì rán yí yàng	像大自然一样	in a way similar to nature	noun phrase
xuǎn	选	to choose	verb
xué xiào guī zé	学校规则	school rules	noun
yán guàn / hú jiāo guàn	盐罐 / 胡椒罐	salt/pepper shaker	noun
yǔ yī / fēng yī	雨衣 / 风衣	rain jacket/wind breaker	noun
yùn dòng guī zé	运动规则	sports rules	noun
zhōng jiān de yuán quān	中间的圆圈	center circle	noun
识记 Produce			
Pīnyīn	Characters	English meaning	Parts of speech
bú shì zhēnzhèng de	不是真正的	not real	verbal phrase

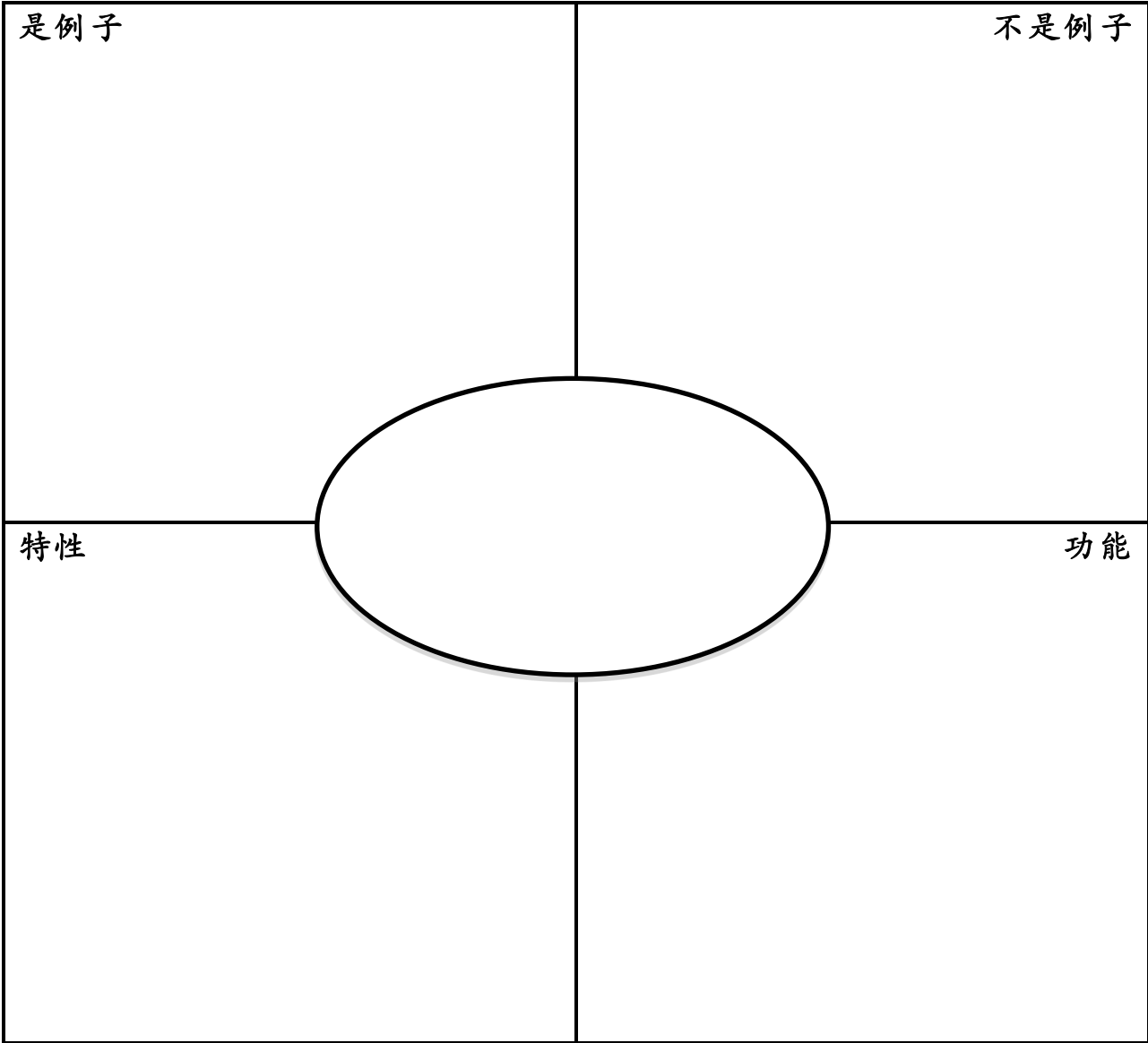
bù tóng de	不同的	different	adjective
cái liào guǎn lǐ yuán	材料管理员	Magnificent Materials Manager	noun
fáng zi	房子	house	noun
fēi jī	飞机	airplane	noun
fēi lì zǐ	非例子	non example	noun
gōng zuò guǎn lǐ yuán	工作管理员	Terrific Taskmaster	noun
jì lù yuán	记录员	Remarkable Recorder	noun
lì zǐ	例子	example	noun
qì chē	汽车	car	noun
qīng wā de pí fū	青蛙的皮肤	frog skin	noun
rén zào de	人造的	human made	adjective
shí wù	实物	thing	noun
wán jù fáng zi	玩具房子	toy house	noun
wán jù fēi jī	玩具飞机	toy airplane	noun
wán jù qì chē	玩具汽车	toy car	noun
xiǎng fǎ	想法	idea	noun
xiāng sì de	相似的	similar	adjective
yǎn shì zhì jiǎn yuán	演示质检员	Polished Presenter	noun
zhēnzhèng de	真正的	real	adjective
zhōng wén dū chá yuán	中文督察员	Chinese Champion	Noun

姓名: _____

日期: _____

FRAYER 概念思考图

第一部分：观察一下这些不同的模型的图片，把它们写在“是例子”的格子里。然后想出一些不是模型例子，把它们写在“不是例子”的格子里。接下来，在“特性”这一格里写出模型的特性。最后，写出模型的功能（模型是用来做什么的）。

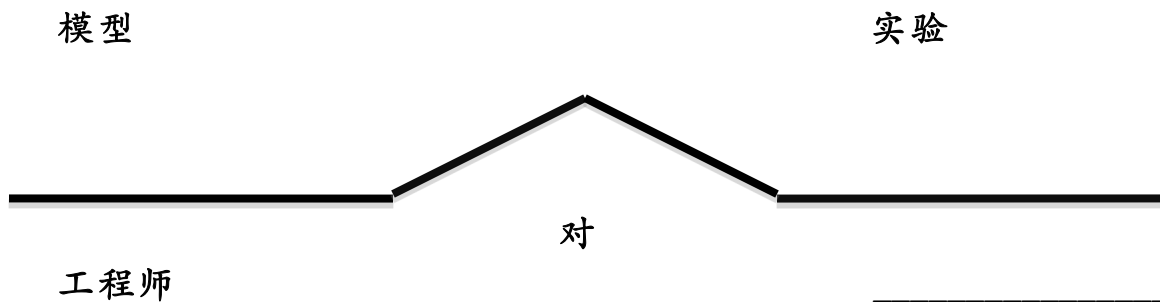


第二部分：

1. 根据 FRAYER 概念思考图上的内容，你能写出“模型”的定义吗？

2. 什么样的专业人员使用模型？

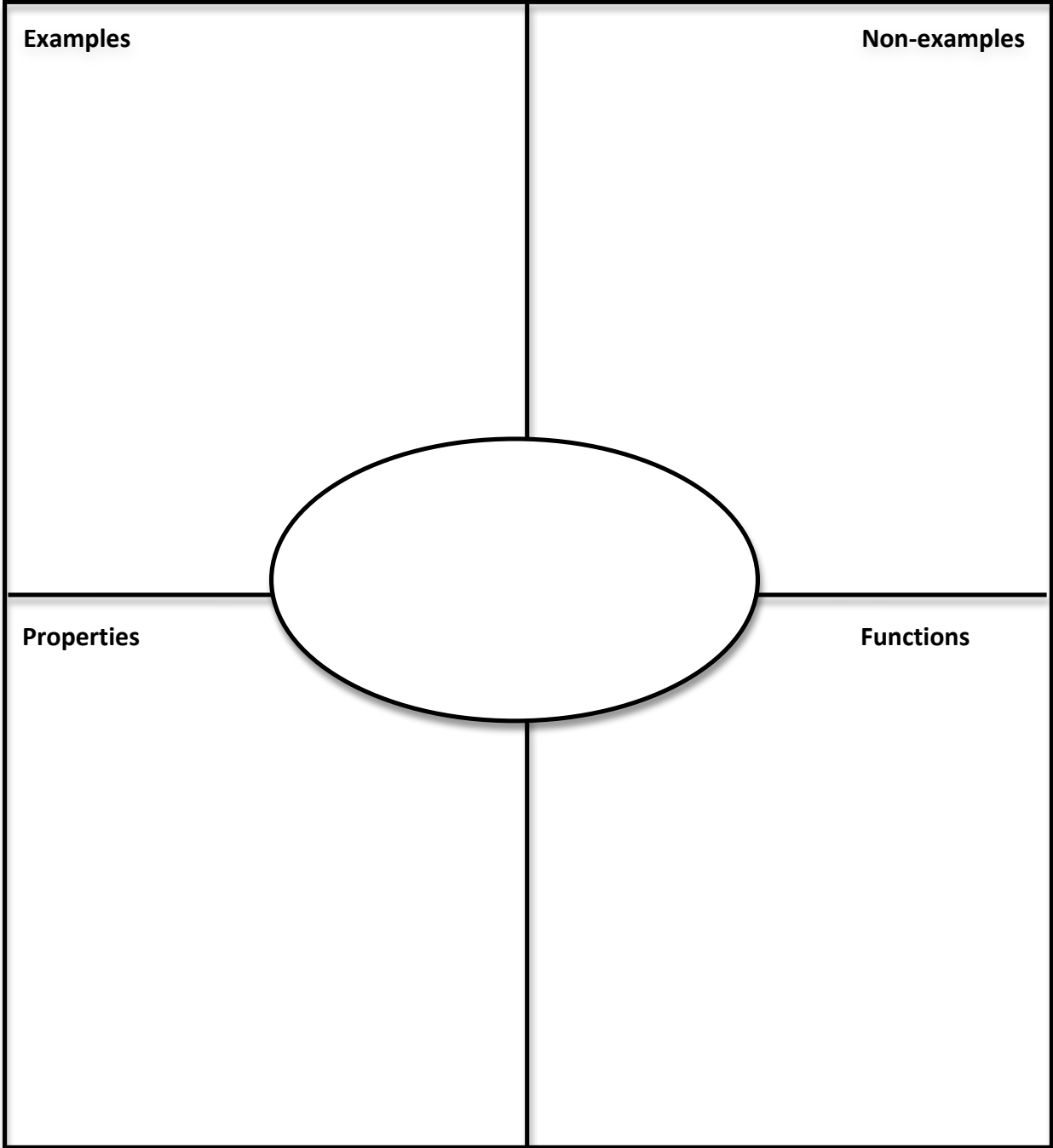
3. 完成以下的“桥”：



Name: _____ Date: _____

The Frayer Model – A Concept Thinking Map

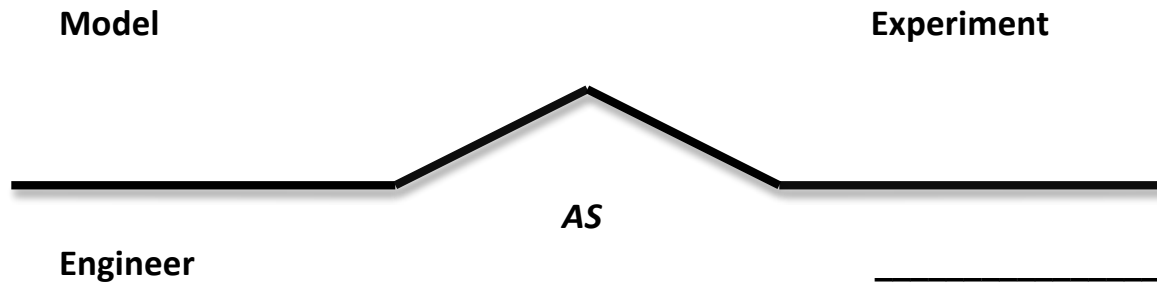
Part I: Observe the different model images. Make a list of them in the “examples” quadrant and brainstorm a list of “non-examples”. Then write down any common characteristics you see for a “model.” Lastly, describe what a model is used for (its function).



1. Using the information on your Frayer Map what is a good definition of “model”?

2. What kinds of professionals use models in their work?

3. Complete this Bridge Map:

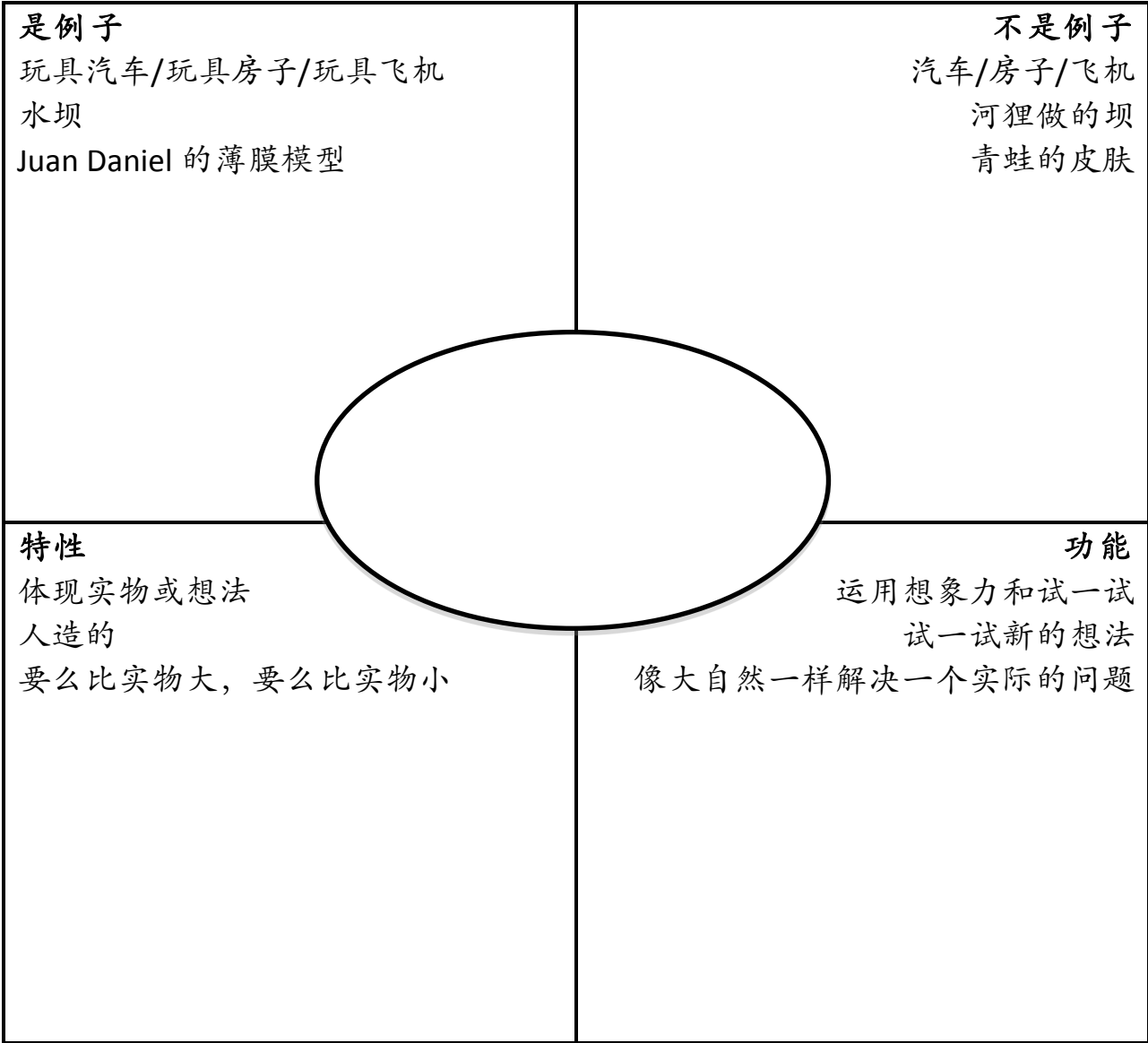


姓名: _____

日期: _____

FRAYER 概念思考图

第一部分：观察一下这些不同的模型的图片，把它们写在“是例子”的格子里。然后想出一些不是模型的例子，把它们写在“不是例子”的格子里。接下来，在“特性”这一格里写出模型的特性。最后，写出模型的功能（模型是用来做什么的）。



第二部分：

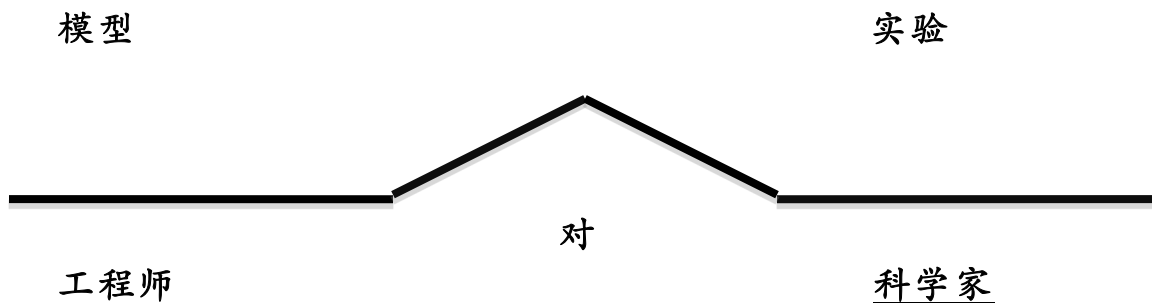
1. 根据 FRAYER 概念思考图上的内容，你能写出“模型”的定义吗？

注意：这个定义要使用学生们讨论出来的特性和功能。

2. 什么样的专业人员使用模型？

工程师

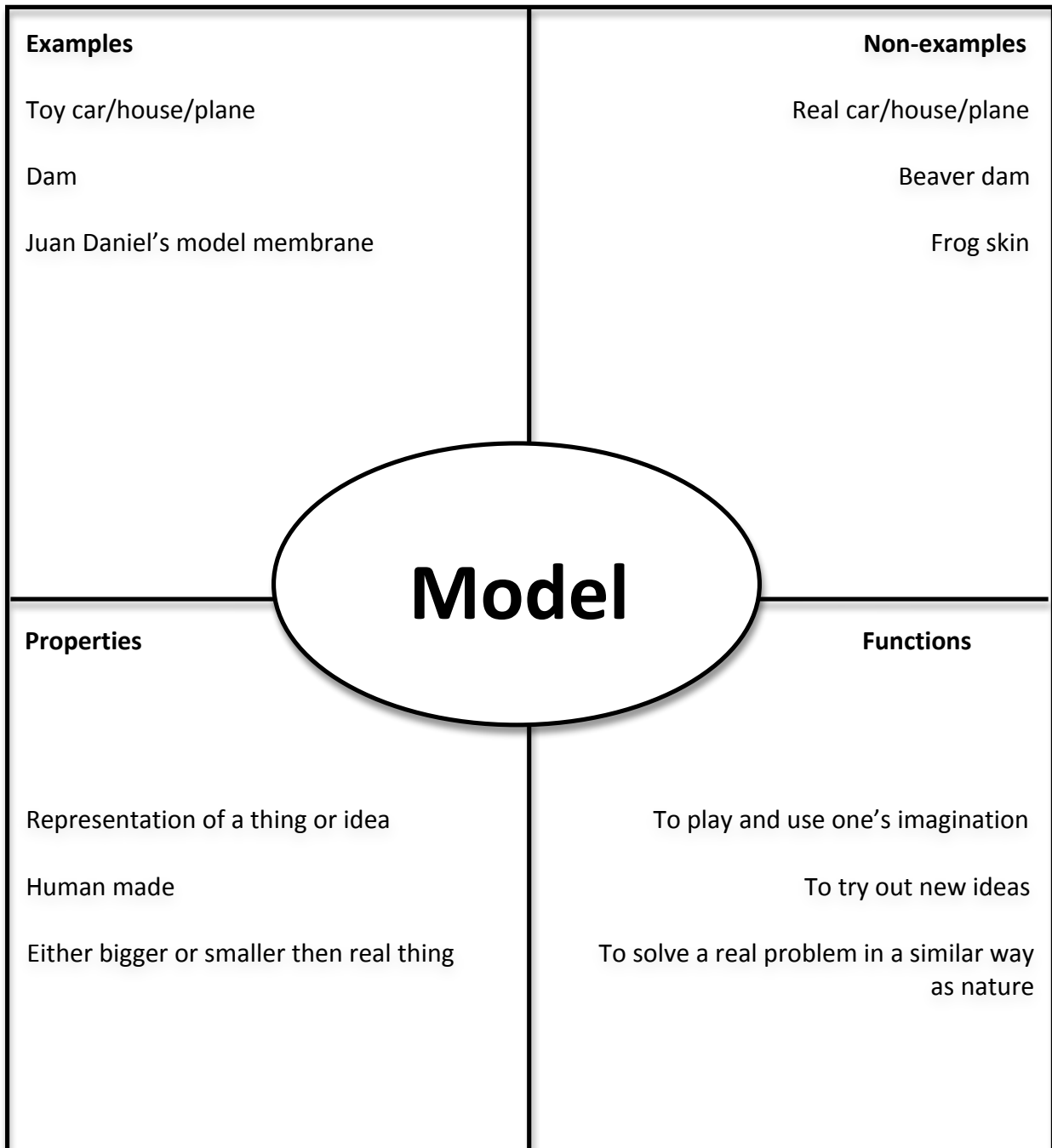
3. 完成以下的“桥”：



Name: _____ Date: _____

The Frayer Model – A Concept Thinking Map Teacher Guide (Key)

Part I: Observe the different model images. Make a list of them in the “examples” quadrant and brainstorm a list of “non-examples”. Then write down any common characteristics you see for a “model.” Lastly, describe what a model is used for (its function).



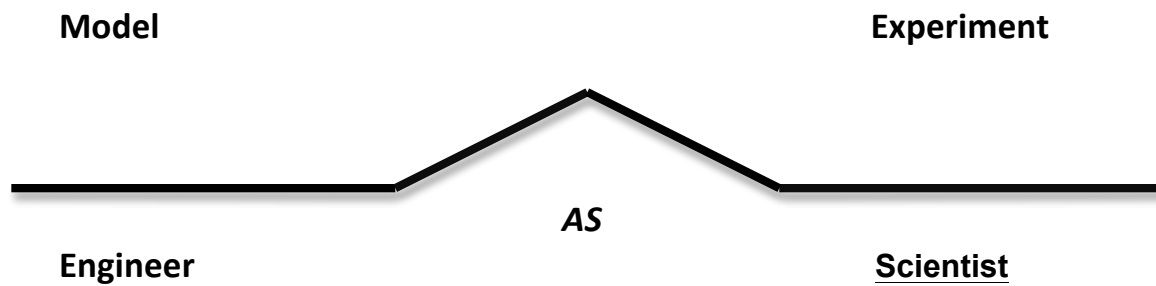
1. Using the information on your Frayer Map what is a good definition of “model”?

Definitions should include examples of student-generated functions and properties.

2. What kinds of professionals use models in their work?

Engineers.

3. Complete this Bridge Map:



薄膜模型材料神秘袋

姓名: _____

日期: _____

袋子号	圈出材料的特性	选出薄膜模型的特性	画出来	材料名称	圈出你的推测
	厚 薄 有孔 没有孔 光亮 平滑	<input type="checkbox"/> 有肉眼看不到的小孔 <input type="checkbox"/> 能让某些东西通过 <input type="checkbox"/> 能阻挡某些东西 <input type="checkbox"/> 可以控制流速(让某些东西快速或慢速地通过)			可能有用 可能没用
	厚 薄 有孔 没有孔 光亮 平滑	<input type="checkbox"/> 有肉眼看不到的小孔 <input type="checkbox"/> 能让某些东西通过 <input type="checkbox"/> 能阻挡某些东西 <input type="checkbox"/> 可以控制流速(让某些东西快速或慢速地通过)			可能有用 可能没用
	厚 薄 有孔 没有孔 光亮 平滑	<input type="checkbox"/> 有肉眼看不到的小孔 <input type="checkbox"/> 能让某些东西通过 <input type="checkbox"/> 能阻挡某些东西 <input type="checkbox"/> 可以控制流速(让某些东西快速或慢速地通过)			可能有用 可能没用

	厚 薄 有孔 没有孔 光亮 平滑	<input type="checkbox"/> 有肉眼看不到的小孔 <input type="checkbox"/> 能让某些东西通过 <input type="checkbox"/> 能阻挡某些东西 <input type="checkbox"/> 可以控制流速(让某些东西快速或慢速地通过)			可能有用 可能没用
	厚 薄 有孔 没有孔 光亮 平滑	<input type="checkbox"/> 有肉眼看不到的小孔 <input type="checkbox"/> 能让某些东西通过 <input type="checkbox"/> 能阻挡某些东西 <input type="checkbox"/> 可以控制流速(让某些东西快速或慢速地通过)			可能有用 可能没用
	厚 薄 有孔 没有孔 光亮 平滑	<input type="checkbox"/> 有肉眼看不到的小孔 <input type="checkbox"/> 能让某些东西通过 <input type="checkbox"/> 能阻挡某些东西 <input type="checkbox"/> 可以控制流速(让某些东西快速或慢速地通过)			可能有用 可能没用

Model Membrane Materials Mystery Bag

Name: _____ **Date:** _____

Bag #	Materials Properties (circle if apply)	Membrane Properties (check if apply)	Draw a Picture	Material Name	Prediction (circle)
	thick thin has holes no holes shiny smooth	<input type="checkbox"/> Has holes that are too small to see <input type="checkbox"/> Allows some things to pass through <input type="checkbox"/> Blocks some things <input type="checkbox"/> Can control flow rate (how quickly/ slowly things pass through)			Might work Might not work
	thick thin has holes no holes shiny smooth	<input type="checkbox"/> Has holes that are too small to see <input type="checkbox"/> Allows some things to pass through <input type="checkbox"/> Blocks some things <input type="checkbox"/> Can control flow rate (how quickly/ slowly things pass through)			Might work Might not work
	thick thin has holes no holes shiny smooth	<input type="checkbox"/> Has holes that are too small to see <input type="checkbox"/> Allows some things to pass through <input type="checkbox"/> Blocks some things <input type="checkbox"/> Can control flow rate (how quickly/ slowly things pass through)			Might work Might not work

	thick	thin	<input type="checkbox"/> Has holes that are too small to see <input type="checkbox"/> Allows some things to pass through <input type="checkbox"/> Blocks some things <input type="checkbox"/> Can control flow rate (how quickly/ slowly things pass through)			Might work
	has holes	no holes				Might not work
	shiny	smooth				
	thick	thin	<input type="checkbox"/> Has holes that are too small to see <input type="checkbox"/> Allows some things to pass through <input type="checkbox"/> Blocks some things <input type="checkbox"/> Can control flow rate (how quickly/ slowly things pass through)			Might work
	has holes	no holes				Might not work
	shiny	smooth				
	thick	thin	<input type="checkbox"/> Has holes that are too small to see <input type="checkbox"/> Allows some things to pass through <input type="checkbox"/> Blocks some things <input type="checkbox"/> Can control flow rate (how quickly/ slowly things pass through)			Might work
	has holes	no holes				Might not work
	shiny	smooth				

薄膜模型材料推测问卷

小组号: _____ 姓名: _____ 日期: _____

材料名称: _____

我推测 “可能有用”	依据 我觉得“可能有用”，因为……
我推测 “可能没用”	依据 我觉得“可能没用”，因为……

Model Membrane Materials Prediction Survey

Group #: _____ Name: _____ Date: _____

Material Name: _____

I predicted "Might work"	Supporting Ideas I think so because...
I predicted "Might not work"	Supporting Ideas I think so because...

姓名：_____ 日期：_____



探索薄膜的世界

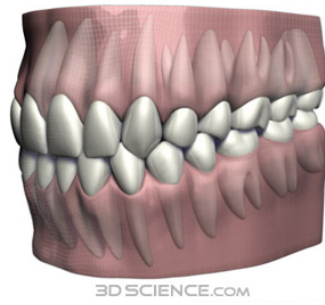
说明：将你的测试结果记录在下面的表格里。在“预测”栏里圈出你的预测；在“水量”栏里写出有多少水通过这个材料；在“速率”栏里写下水通过这个材料的速度；在“观察结果”栏里写出你看到的情况。

材料	预测	水量	速率 (水量/时间)	观察结果
海绵	可能管用 可能不管用	全部 部分 没有	快 中 慢	
铝箔纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	
有一个孔的 铝箔纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	
有两个孔的 铝箔纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	

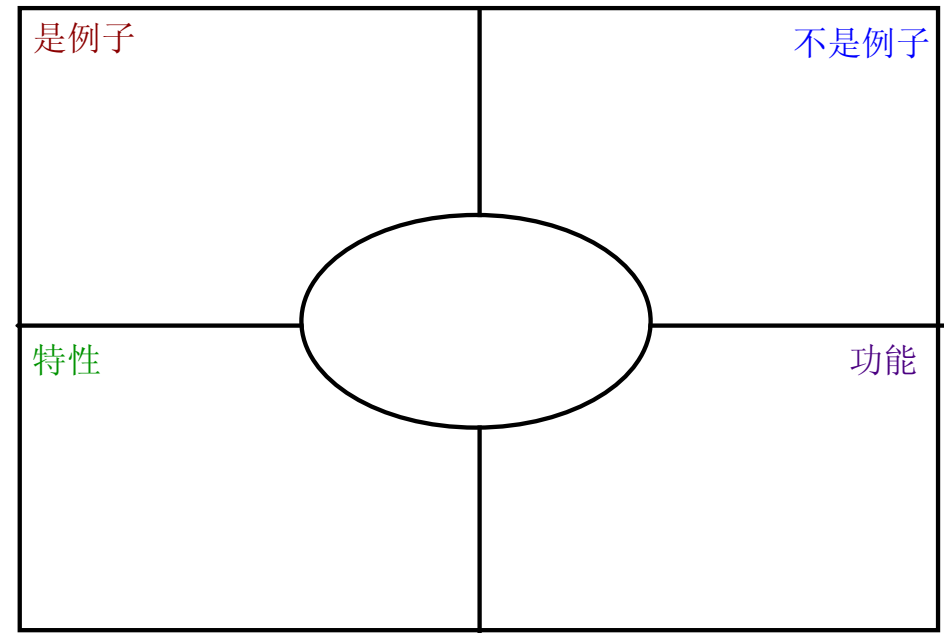
姓名: _____ 日期: _____

材料	预测	水量	速率 (水量/时间)	观察结果
毡布	可能管用 可能不管用	全部 部分 没有	快 中 慢	
纱布	可能管用 可能不管用	全部 部分 没有	快 中 慢	
10层咖啡过滤纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	
尼龙纱窗布	可能管用 可能不管用	全部 部分 没有	快 中 慢	
其他	可能管用 可能不管用	全部 部分 没有	快 中 慢	

模型是什么？

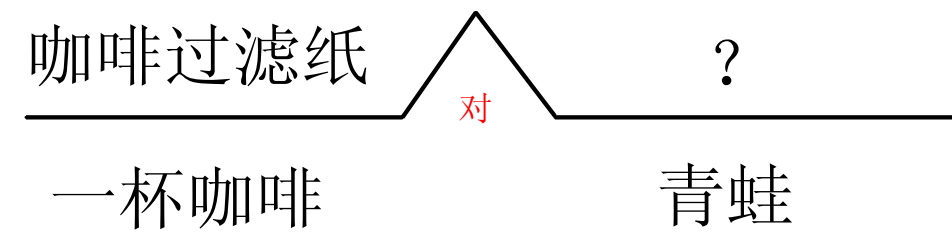
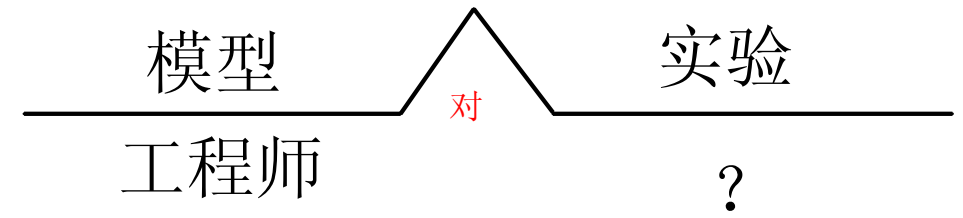


Frayer 概念思考图



1. 根据Frayer概念思考图上的内容，你能写出“模型”的定义吗？

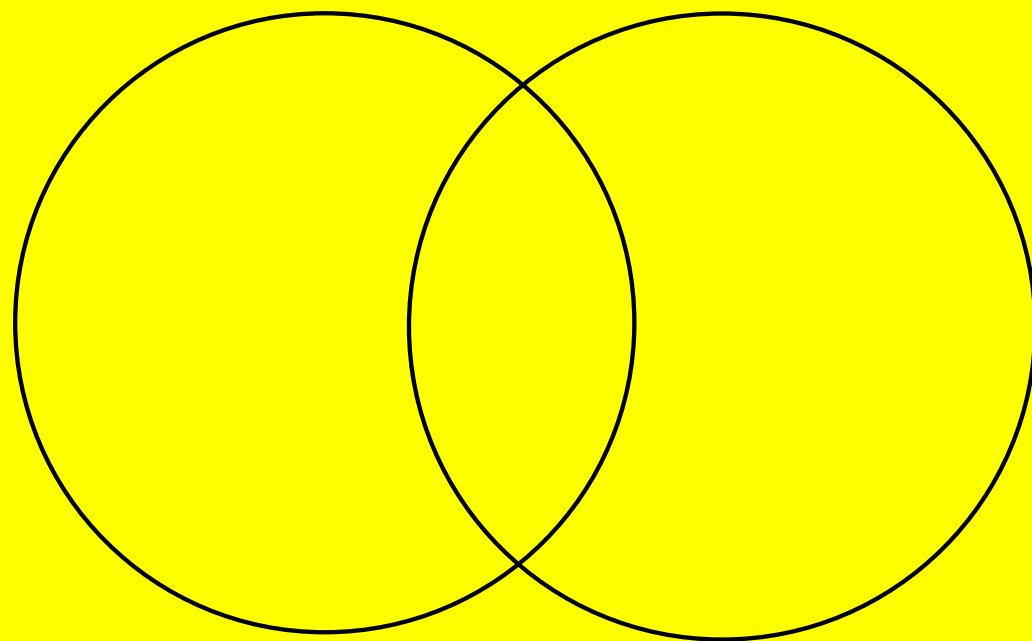
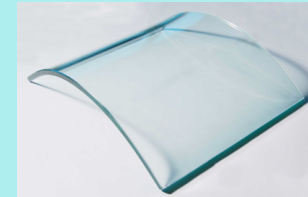
2. 什么样的专业人员使用模型？



天然薄膜的特性

从以下两个活动，我们学到了哪些薄膜的特性？

薄膜角色扮演活动	葡萄干实验



在纸上写出每个小组成员的名字
把你们观察的物体的名称写下来

讨论一下这个物体跟天然的薄膜有什么相似和不同的地方

选择一个你们要用的系统图

在你们选择的系统图上写出这个物体跟天然薄膜相同和不同的特性

画出这个物体作为或者不可能作为天然薄膜

以小组为单位准备一下介绍小组的成员并口头演示你们对比的系统图。注意要用这些句型：

X像天然的薄膜一样，因为它 / 它有.....

X不像天然的薄膜，因为它 / 它有.....



a. 纱布

b. 铝箔纸

c. 尼龙纱窗布

d. 毡布

e. 海绵

f. 咖啡过滤纸

1



2



3



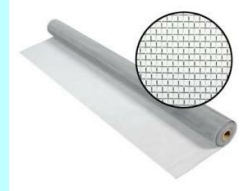
4



5



6



学生A

你对_____的推测是什么？

(有一个孔的铝箔纸、有两个孔的铝箔纸、咖啡过滤纸、纱布、毡布、海绵和尼龙纱窗布)

学生B

我推测_____可能管用/不管用。

学生A

为什么？

学生B

我推测_____可能管用/不管用，因为它/它有_____。

材料名称：_____

我推测“可能有用”	依据 我觉得“可能有用”，因为……
我推测“可能没用”	依据 我觉得“可能没用”，因为……

中文督察员或演示质检员

- 鼓励大家只说中文
- 帮助小组成员使用正确的字词和短语
- 向全班汇报结果

记录员

- 记录小组的答案

材料管理员

- 领取并分发各种材料
- 把实验用的材料放回正确的位置

工作管理员

- 确保小组成员掌握时间
- 带领小组一步一步的执行任务
- 向每个测试的材料中倒水

材料	预测	水量	速率 (水量 / 时间)	观察结果
海绵	可能管用 可能不管用	全部 部分 没有	快 中 慢	
铝箔纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	
有一个孔的铝箔纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	
有两个孔的铝箔纸	可能管用 可能不管用	全部 部分 没有	快 中 慢	

观察结果和推测

我/我们猜_____在薄膜模型里可能管用/不管用，因为它/它有.....
我们的推测是对的。

我/我们猜_____在薄膜模型里可能管用/不管用。
然而，经过实验，我/我们发现_____管用/不管用，因为它/它有.....