How to improve kindergartner science observation skills

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This curriculum unit is recommended for:
Kindergarten, 1st or 2nd grade science and language immersion classes

Keywords: science, immersion, Kindergarten, observation

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: This curriculum unit is designed for use in a science class for kindergarten or lower elementary language immersion classroom. The curriculum unit is focused on science teaching strategies and developing language skills in the immersion class. The curriculum unit focuses on weather. Each lessons contains different science experiments, activities and games.

In this curriculum unit, students will be introduced to science concepts, do hands-on activities, develop experimental skills, while at the same time, developing target language skills. The goal is for students not only to learn science content in the target language, but also to help students improve their experimental skills. In the scientists' world, science experiments do not just follow steps like a recipe. Observation skills and communication skills are necessary for success in science.

I plan to teach this unit during the coming year to 21 students in my kindergarten Chinese immersion class.

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How to improve kindergartener science observation skills

Xi Lin

Introduction

Science in early childhood education is important. Research studies in developmental and cognitive psychology indicate that environmental effects are important during the early years of development, and the lack of needed stimuli may result in a child's development not reaching its full potential[i]. Therefore, science education in early childhood is of great importance to many aspects of a child's development, and researchers suggest that science education should begin during the early years of schooling.[ii]

Observation is a central part of the scientific method or process. A core skill of a scientist is to make good observations. An observation consists of receiving knowledge of the outside world through our senses, or recording information using science tools and instruments. Any data recorded during an experiment can be called an observation. This unit focuses on developing good observation skills in kindergarten students.

Rationale

This is my second year teaching in the United States. I was a language teacher in China before coming to Charlotte. Before I joined this CTI seminar, my goal was simply to improve my students' science EOG scores. Fifth graders have their first science EOG test. However, during this CTI seminar, we have visited different science laboratories on the UNC Charlotte campus and talked to professors about their research programs. I realized that good observational and laboratory skills are important for students when they go to college, so I am focusing this unit on starting to build my students' science skills. My hope is that when my students are in university, they will have the science skills they need to be successful. For my students, kindergarteners. I focus on how to improve their science observation skills because it is a central skill of the scientific method or process. Because my kindergarten students are naturally curious, they will be able to easily develop this skill now and carry it with them as they continue through the rest of their education.

In previous years, I have taught 5th grade science in the immersion class. I have noticed that when students study for a test, some of them concentrate on memorizing the

science facts and concepts. In addition, some students see the hands-on science activities as recipe-like experiments. These students lack good science observation and critical thinking skills. Some of these students might get a good score will on the 5th grade EOG test. However, they will have a hard time in science when they move to middle/high school because they are relying on memorization instead of understanding in their science learning.

Instead of memorization, I want to inspire a passion to learn about science, build fundamental science skills and apply these skills in real life. According to the dictionary, the definition of Science is "the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment." This unit will focus on the essential skills of observation and experiment.

In this unit, I focus on improving science observation skills by teaching weather content. Weather questions from the 5th EOG are some of the most challenging for most students. Earth science and weather made up 15-17% of 2015-2016 EOG test. Students across CMS did not perform well on these questions with only 30.4% answering questions about these subjects correctly. Student performance on the earth science and weather section of the EOG was the lowest among all the 5th science EOG topics. Improving observation skills and basic understanding of weather for my kindergarten students will start developing the knowledge that they will need to master the content on weather that they will learn in higher grades. In the kindergarten weather unit, there are 2 main parts.

NCES.K.E.1.2- Summarize daily weather conditions noting changes that occur from day to day and throughout the year. Students may have a solid background in weather and have many experiences to share.
NCES.K.E.1.3- Compare weather patterns that occur from season to season. Students maybe familiar with weather changes but might not know all the necessary vocabulary to describe them. Based on observations and information, weather patterns can be predictable.

School Demographics

I am a teacher at E.E.Waddell Language Academy (formerly Smith Academy of International Languages). My school is a K-8 language immersion magnet school.

Geographically, the school is located in South Charlotte, North Carolina in the Charlotte-Mecklenburg School District. Waddell offers language immersion in Chinese, German, French, and Japanese for grades K through 8 and Spanish for middle school students. The school has a population of 1,387 students with 940 students at the elementary level and 447 in middle school. Our school is very diverse. The majority of the staff are bilingual and 30 percent of the teachers and teacher assistants do not have US citizenship. The student body is very diverse as well: 46% White, 24% African-American, 20% Hispanic, 5% Asian and 5% multiracial. Thirty-four percent of the K-8 students qualify for free or reduced lunch. The Parent Teacher Student Association (PTSA) is extremely active and supportive. Our school was a North Carolina Honor School of Excellence for several years. It was awarded the national 2012 American Council on the Teaching of Foreign Languages (ACTFL) Melba D. Woodruff Prize for Exemplary Foreign Language Program. This prize recognizes schools that align their curricula with the World Readiness Standards for Language Learning and integrate languages with content areas. E.E.Waddell Language Academy was recognized as a Magnet School of Distinction by the Magnet Schools of America in 2016. During the 2015-2016 school year, the science EOG results showed that 89.9% of students were proficient at Levels III/IV/V. That's an 8.2% increase from last year and this sets a high standard for next school year.

Student Demographics

I teach a kindergarten Chinese immersion class. There are 21 students in my class from diverse backgrounds - 33% African-American, 33% Hispanic, 19% White, 10% multiracial and 5% Asian. My science curriculum is based on the North Carolina Essential Standards and paced according to the CMS yearly pacing guides. I am teaching 3 science lessons per week and each lesson is 40 minutes in length. Kindergarteners do not have any science lab class as a special lesson. The 2 hours of instruction in my classroom is the only science time for my students.

In this unit, I focus on improving science observation skills through learning about the weather. Students will observe the weather each school day and then summarize daily weather conditions noting changes that occur from day to day and throughout the year. Students will compare weather patterns that occur from season to season.

Teaching Science in an Immersion Classroom

Language immersion, or simply immersion, is a method of teaching a second language in which the learners' target language is the medium of classroom instruction. Through this method, learners study school subjects, such as math, science, and social studies, in their target language. The main purpose of this method is to foster bilingualism, in other words, to develop learners' communicative competence or language proficiency in their L2 in addition to their first or native language. Additional goals are the cognitive advantages to bilingualism. The language science immersion prepares students in the interdisciplinary scientific study and analysis of human language. Language science is directly applicable to students interested in human-environment interaction, brain and cognition, language acquisition, interpreting, relevant branches of target cultures and policy studies.

There are three important principles for teaching science in an immersion classroom
1. Actively involve students: Actively involving students in learning science can be achieved by using manipulative materials in hands-on activities.
2.Integrate language in science: In the immersion classroom, language instruction should not be separate from subject instruction. Students' ability to understand concepts and develop skills is dependent on their skills in the immersion language.
3.Adapt Language and content instruction to student background and life experiences: Make connections between science learned in the classroom and the world outside the classroom. Students need to see that the skills and concepts they explore in the classroom are important and applicable in their everyday lives.

Developing Science Observation Skills

In the science class, my goal is to introduce and refine the inquiry skills of young learners (kindergarten, 1st and 2nd graders), particularly students with limited language skills. My unit includes easy-to-implement workshop activities to help meet my goal. The activities focus on making good observations. These skills not only help to focus young children's natural curiosity but also build a solid foundation for future scientific learning.

Four tips to help children develop observation skills.
1. Teach children that to observe something is to pay close attention to something. Use their five senses where appropriate: seeing; hearing; touching; smelling; tasting.

Children must be instructed they should only touch or taste something if an adult says it is safe.
2. Remind children that observing something well means to see things from different angles, places, times and over time. The longer the time you have to make observations, the better the information will be.
3. Provide different observation tools like magnifying glasses, microscopes, rulers, and measuring tapes; thermometers; stopwatches, etc. Through practice, children will learn which tools will best help them in their respective observations.
4. Emphasize that recording observations is just as important as making them. When recording observations, use words, numbers, pictures, photos and videos. Experiment recording observations on different types of graphic organizers. It is important to be neat and organized.

Scientific Content – Overview for Teachers

Weather is the way conditions around us changes from day to day. The three main parts of weather are temperature, precipitation (rain /snow) and wind. Weather changes from day to day. Seasons are patterns in the weather that repeat year to year. The main driver of weather and weather patterns is the sun. The sun heats the air, which causes changes in temperature, air pressure and winds. Further, the heat provided by the sun causes water to evaporate. There are several weather tools that help us observe the weather. We can measure changes in temperature by using a thermometer. We can measure the amount of precipitation by using a rain gauge. We can observe wind by using an anemometer.

Teaching strategies

I have divided the unit into a pre-teaching section followed by three lessons. I plan to cover the material in the pre-teaching section and lessons in two weeks. Before beginning the unit, I will pre-teach the key words for the unit. After I teach the key words in the target language, I will practice with students in different ways. Students can practice at home using the gongfubb website (gongfubb.com). In addition, I will practice with the students using Kahoots quizzes with pictures. I will also pre-teach the key words with a mini-book about seasons that I created. In addition, my class will discuss the weather as part of our morning routine.

As I start to share the weather content with students, I will use a variety of strategies to help with language skills and content knowledge. I will share content related songs with students. The website beva (g.beva.com) is a good website for Chinese early education and there are some weather songs on the website. I will also encourage parents to play these songs with children at home. I will also use technology and other resources in my lessons including a promethean board, videos from Discovery Education, Study Jams, You Tube, and mini-books from primary school science (Chinese website:www.pep.com.cn/xxkx/), and Raz-kids A-Z. Also, I will create some mini-books in the target language. I will also use Discovery Education's Tech Book as part of my Science curriculum. This online resource provides a variety of video clips, reading passages and activities to engage students. Students are assigned individual Chrome Books to use during class investigations. I use an iPad in my classroom and incorporate a variety of both content and product Apps during classroom instruction.

Activities are chosen that will create inquiry-based science experiences for my students. Most lessons are interactive and are divided into teacher input, guided practice or additional investigation, followed by independent practice or a group inquiry activity. Students' discussion of their results will generate additional questions or ideas for additional investigation. Lab and activities include both teacher directed inquiry labs and student created lab which address a general inquiry question. Students frequently participate in learning stations consisting of both research based and hands-on activities.

In each lesson, I focus on hands-on activities for each lesson's topic. Instead of giving students specific steps to follow in their experiments, I encourage students to explore. Also, I encourage students to redo the experiment so that they will learn the importance of repeating experiments and being careful. We will concentrate on making good observations and I provide an observation sheet for each science activity or experiment.

Classroom Lessons and Activities

Pre-teaching

I teach students about the key words with mini-books and on-line resources. Students should have solid listening, speaking and reading skills with the key words. An example of a mini-book is given in the appendix.

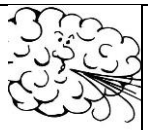
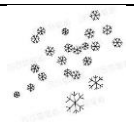
Weather as Part of Class Morning Routine

We will observe the weather as part of our morning routine for two weeks and record our observations on the worksheet given below. The first week, we will fill the worksheet out together as part of our morning routine. I will help the students decide how they will measure and record each aspect of the weather. During the second week, the students will record their observations about the weather by themselves. At the end of each week, the whole class will talk about the observations we recorded. As we discuss the weather in the morning, I will challenge students to predict the weather for the following day and explain why they make their predictions.

Table to record weather observations.

日期	温度 	风 	雨 	云 	雪 	太 阳 	感 觉 
_月_日							
_月_日							
_月_日							

Date	temperature	wind	rain	cloud	snow	sun	feeling

							
_month_day							
_month_day							
_month_day							

Lesson 1 天气（ weather ）

Lesson Goal：

By the end of this lesson, students should be able to：

1. Observe the weather and identify specific weather conditions by their characteristics. (Including, 晴 sunny，风 windy，雨 rainy，雪 snowy, 云 cloudy, etc.)
2. Use charts and reliable sources of weather data to record and analyze weather patterns.
3. Gather and record data about changes in daily weather over time.

Lesson Questions:

1. What is weather?
2. How can we observe the weather?

Key Vocabulary:

天气 Weather, 太阳 sun, 热 heat, 温度 temperature,云 cloud,晴 sunny,雨 rain,风 wind，雪 snow.

Warm up activity: Sing the weather song. The lyrics of the song are in Appendix 2 and a link to a video of my class singing the song is given in Appendix 4.

After the warm up song, the class will read the mini-book, “What is the weather, today? (今天什么天气). This mini-book is provided in Appendix 5.

Class activities:
1. Ask students to describe the current weather. Have the students look through a window and describe what they see. Write the words they use to describe their observations on a white board.
2. Watch the video about weather form DiscoveryED and beva website. Then do the Kahoots quiz based on the video. (Links are provided in Appendix 2.)
3. Show the students simple weather tools including a thermometer, weather vane, rain gauge, etc. Ask the students to look at the tools and tell you what they think each tool is used to measure. After they share their ideas, explain how to use the weather tools and what the weather tools are for.

Lesson 2 四季（ seasons）

Lesson Goal：
By the end of this lesson, students should be able to：
1. Observe the weather and identify specific seasons by their characteristics.
   (春天 spring，夏天 summer，秋天 fall，冬天 winter)
2. Explain how weather is likely to change over longer periods (seasons).
3. Describe observable and measurable characteristics of seasons.

Lesson Questions:
1. What are seasons?
2. What is the different between the four seasons?

Key Vocabulary:
春天 spring ,夏天 summer ,秋天 fall ,冬天 winter,冷 cold, 热 hot,

Warm up activity: Sing the Season Song. The lyrics of the song are in Appendix 3 and a video of students singing the song is in Appendix 4.

After the warm up song, the class will read the mini-book, “Four Seasons in a Year (一年有四季) (see Appendix 5).

Class activities
1. Obtain pictures from magazines, the internet or books. Show students pictures of different types of seasonal clothing and /or objects used in different types of weather.

These may include pictures of clothing such as a heavy jack, T-shirt, sweater, a bathing suit, an umbrella, ice skates, rain boots, etc. Ask students to name each object and tell when or why they use it. Guide students to begin making connections between the objects pictured and the season. For example, say: 天冷穿厚衣，夏天穿厚衣吗？（It is nice to wear a heavy jack when it is cold outside. Do you wear heavy jack in summer?)

2. Watch the video about seasons from DiscoveryED and beva website and then do the Kahoot quiz based on the video (see Appendix 2 for links).

3. Activity: Exploring with Ice. Give students a plastic bowl of ice cubes and let them play and make their own discoveries. Students might try stirring, pouring, stacking, building, rubbing, etc. Encourage students to record their observation by drawing or writing in a science notebook. After the students have explored with the ice, ask them questions such as "What makes ice melt?" In addition, ask students why they think snow melts?

Lesson 3 天气变化（weather changes）

Lesson Goal：
By the end of this lesson, students should be able to：
1. Explain how weather is likely to change over short periods (day and night).
2. Describe weather patterns in terms of variations in temperature, precipitation and wind speed.

Lesson Questions:
1. How does the sun affect the weather?

Key Vocabulary:
热 hot, 太阳 sun，温度 temperature，降水 precipitation，水 water，蒸发 evaporation, 水循环 water cycle.

Warm up activities
1.Watch video about 小水滴的旅行 (The Water Drop's Journey – see Appendix 2).

Class activities
1. Watch video "Water Cycle" from DiscoveryED (see Appendix 2).

2. Do the activity “Is It Raining?” The details of this activity are provided in Appendix 7.

Assessment

To determine if this unit is successful students will be assessed in various ways.
1. Students will be given a pre and post worksheet on weather. I will compare their performance on these worksheets to measure improvement in their understanding of weather.
2. Students should be able to read the mini-books by themselves.
3. Students should be able to pass the Science for Kids weather game (这是我的天气-儿童气象学), which is downloadable from iTunes. In the App, students choose the appropriate clothing for different temperatures.
4. Student should be able to pass the Kahoot quizzes.

Appendix 1: Implementing Essential Standards

- NCES.K.E.1.2 - Summarize daily weather conditions noting changes that occur from day to day and throughout the year.
- NCES.K.E.1.3 - Compare weather patterns that occur from season to season.

Appendix 2: Resources for Teachers and students

Discovery Education - Resources for both teacher and students. Common-core related lessons.

Lesson 1 Weather link

- https://app.discoveryeducation.com/learn/videos/d900320d-1bd0-45bc-8912-6af9286cbf3c?hasLocalHost=true
- Defines weather and explains different types of weather.

Lesson 2 Season links

- https://app.discoveryeducation.com/learn/videos/D3C12CA7-6EED-4BCD-B6BF-6534D49DBE56?hasLocalHost=true&homework_id=
- Describes the four seasons and explains that with each season, the weather changes.
- https://app.discoveryeducation.com/learn/videos/0b68d59e-fb59-418a-a75c-b1360fe5bf20?hasLocalHost=true
- An overview of the different types of weather. The video explains what weather is and how it is related to the seasons.

Lesson 3 Water Cycle

- https://app.discoveryeducation.com/learn/videos/cb38eac1-e1b2-4ced-84e6-c6411a79ea1c?hasLocalHost=true
- Describes each step of the water cycle and defines precipitation and water vapor.

Study Jams

- http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/weather-and-climate.htm
- Describes weather and climate. There are quizzes included.

Primary School Science (www.pep.com.cn/xxkx/)

- http://www.pep.com.cn/xxkx/xxkxjs/tbjxzy/dzkb/shykj_01/201012/t20101217_988881.htm
- Chinese science textbook that describes weather.

Raz-kids A-Z

- https://www.raz-kids.com/main/Search/?searchTerms=weather
- English science book that describes weather.

悟空识字(gongfubb.com)

- gongfubb.com
- On-line Chinese character games.

贝瓦儿歌(g.beva.com)

- http://g.beva.com/gushi/tianqiwozhidao.html
- Chinese weather song

YouTube

- https://www.youtube.com/watch?v=_1lPplWuzPU
- Describe how to write weather characters.

Pinterest

- https://www.pinterest.com/search/pins/?q=kindergarten%20weather&rs=typed&term_meta[]=kindergarten%7Ctyped&term_meta[]=weather%7Ctyped
- Worksheet website of weather

Education

- http://www.education.com/activity/article/rain_in_a_bag_kinder/
- Science activities for students.

Appendix 3: Songs to sing with students

天气歌 (weather song)
Lyric: 晴天太阳高空照, 阴天乌云挂满天, 刮风云飘风沙沙, 雨天下雨哗啦啦!
On a sunny day, the sun is big in the sky.
On a cloudy day, the grey clouds are all over the sky.
On a windy day, clouds change shapes and we can hear the sound of sha sha sha
On a rainy day, we can hear the raining sound, hua lala.

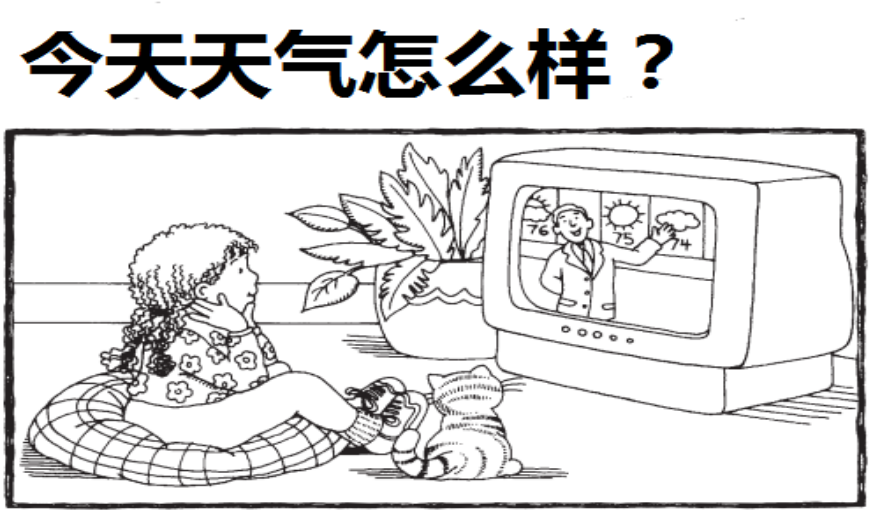
四季歌 (season song)
Lyric:
春天来了百花开，百花开，百花开，春天来了百花开，春天来了。
夏天来了太阳晒，太阳晒，太阳晒，夏天来了太阳晒，夏天来了。
秋天来了叶子飞，叶子飞，叶子飞，秋天来了叶子飞，秋天来了。
冬天来了白雪飘，白雪飘，白雪飘， 冬天来了白雪飘，冬天来了。
Spring comes with flowers.
Summer comes with hot sun.
Fall comes with falling leaves.
Winter comes with snow.

Appendix 4: Videos to Use with Lessons and Kahoot Quizzes

1. Pre-teach resource. Fall mini- book reading.
   https://youtu.be/bvjCnVSlZhw
2. Pre-teach resource. Autumn leaves.
   https://youtu.be/CJHq3a3oWxc
3. Weather song
   https://youtu.be/5z080z4yCO8
4. Season song
   https://www.youtube.com/watch?v=55Gm3OvqkbM
5. Kahoot quizzes
   https://create.kahoot.it/#user/cc82354f-3434-4731-a864-b931c0c25354/kahoots/created

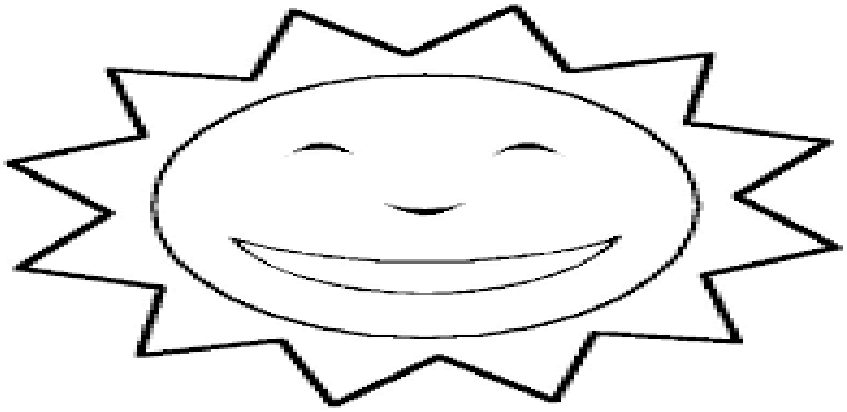
Appendix 5: Mini Book – What is the Weather Today?

Page1



今天天气怎么样？ What is the weather today?

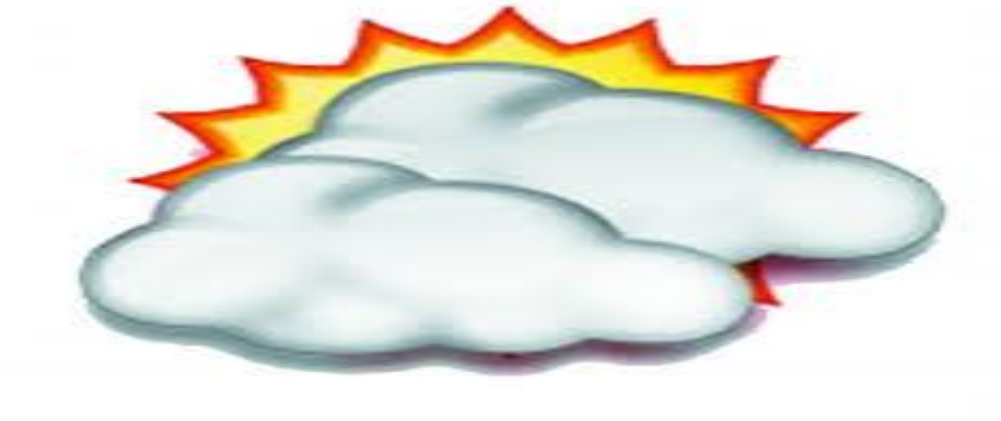
Page2



今天晴。

Today is sunny

Page 3



今天多云。

Today is cloudy.

Page 4

今天大风。

Today is windy.

Page 5

今天下雪。

Today is snowy.

Page 6

今天下雨。

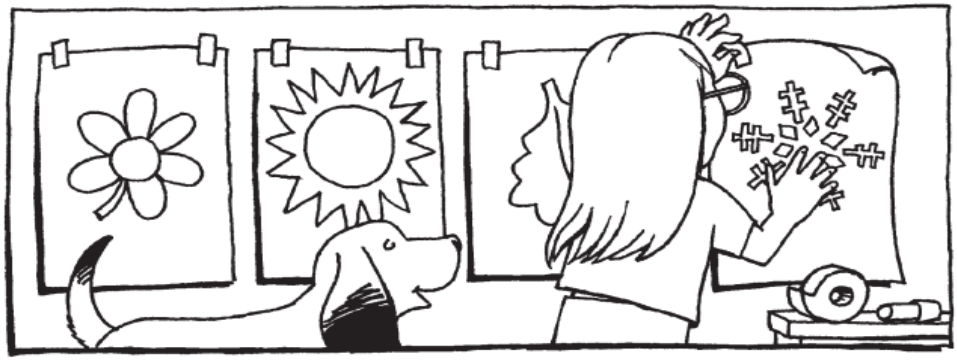
Today is rainy.

Appendix 6: Mini Book - Seasons

Page1

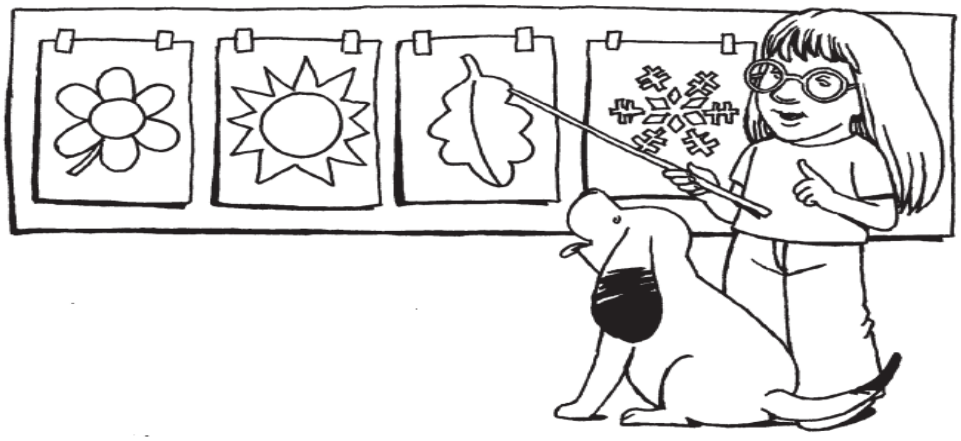
There are 4 seasons in a year　一年有四季(cover page)

Page 2



There are 4 seasons in a year　　一年有四季

Page3



春夏 和 秋冬

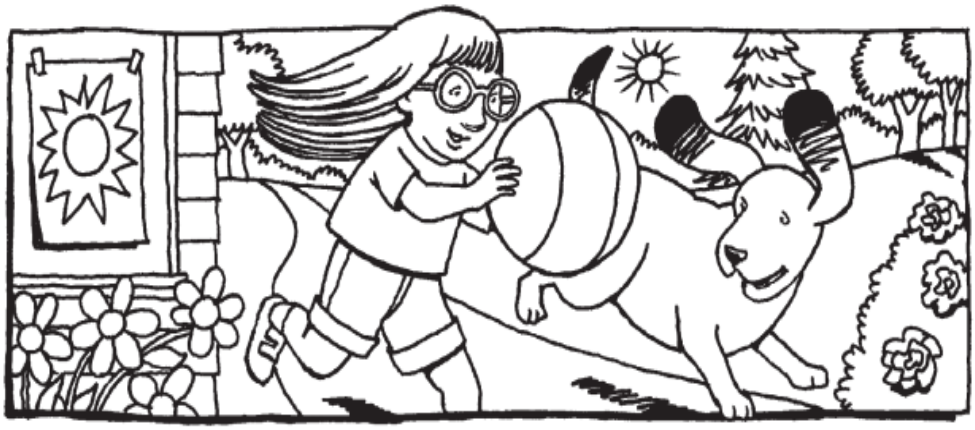
Spring, summer, fall and winter

Page 4

春天百花开

In spring, flowers bloom.

Page 5



夏天太阳晒
In summer, it is sunny.

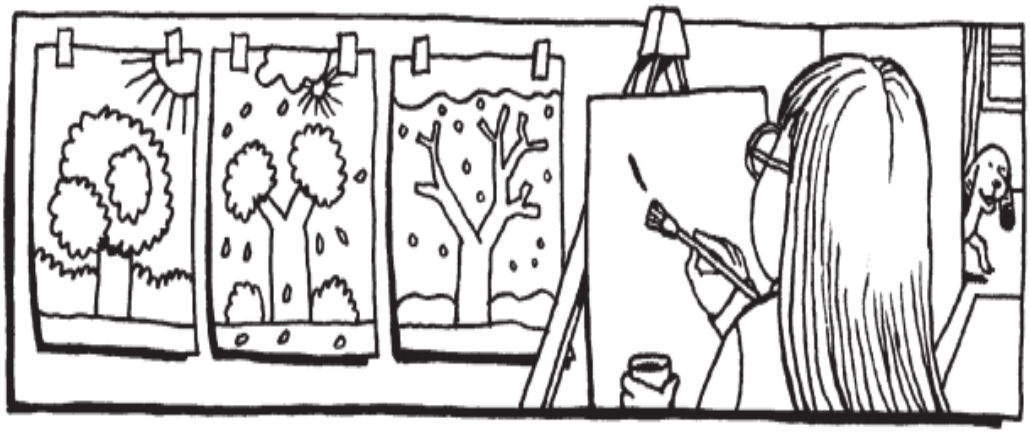
Page 6

秋天叶子飞
In autumn, leaves fall.

Page 7

冬天雪花飘。
In winter, snow flies.

Page 8



春夏秋冬又一年。
Another year，Spring，summer，fall and winter.

Appendix 7 – "Is it Raining" Activity from Education website.
http://www.education.com/activity/article/rain_in_a_bag_kinder/

Help your young scientists observe one of nature's most intriguing phenomena and make rain by recreating the water cycle in a bag. This experiment lets young learners explore the water cycle long before they can define the words like precipitation, evaporation, and condensation. They will watch "clouds" form and "rain" fall in the bag. Be sure to connect what they see in the bag with what they see in nature.

Watch the bag! It will become cloudy as the moisture evaporates and forms a foggy cloud inside the bag. Depending upon your specific conditions (where the window is, how much sunlight is available, outside temperature at the window) this could take two to three hours, or it could take overnight. Once the "cloud" inside the bag can hold no more moisture, your child will notice "rain" coming down the inside walls of the bag. Open and gently mist the bag again, tape to the window, and watch the whole cycle repeat itself.

Observing and predicting are two key skills that help your child become a more focused thinker. Extend his or her thinking by preparing several bags and taping them to windows on opposite sides of the house. Also, let your child predict and then observe what happens when more or less moisture is misted into a bag.

Materials:

Zip-top sandwich bag

Half cup of dirt (potting soil, backyard dirt, etc.)

Plant mister

Tape

Window

Steps:

Plan to work on a tray, newspaper, or a plastic liner since the assembly can get messy!

1. Review the experiment keywords in Chinese. (water, ice, hot, cold...)

1. Observe all the materials.

2. Spoon the dirt into the sandwich bag. The dirt needs to be moist, but not muddy.

3. Zip the bags tightly shut.

4. Tape the bag in a sunny window.

5. Observe the bag.

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The book describe how mathematics and science classes work in the immersions environment.

4 Tara Williams Fortune. *What the Research Says About Immersion.*
This paper provides research about the immersion classroom.

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[i] Hadzigeorgiou 2002

[ii] Eshach & Fried, 2005; Watters Diezmann Grieshaber & Davis 2000