Microteaching Analysis

By: Shally Ackerman, Younghye Bessette, and Jennifer Massengill

Goals for the Learning Cycle

Jennifer's and Shally's Goals

1. To teach science in a fun and engaging manner.
2. To teach students about the different phases of water.
3. To learn about how to manage a primary grade classroom.
4. To teach science in a simple, yet accurate manner.
5. To create a positive learning environments for students that we do not teach on a daily basis (Burry-Stock III: M).

Younghye's Goals

1. To promote students' interests and engagement in experiments (Burry-Stock I: C; Burry-Stock I: C).
2. To help students learn about evaporation and condensation through experiments, group discussions, and class discussions (Burry-Stock I: A; Burry-Stock II: H).
3. To manage behaviors of individual students and students as a whole without hurting interpersonal relations with students (Burry-Stock III: M).
4. To give clear directions to students at every step of activities and experiments (Burry-Stock: III: N).

Goals for the Science Circus

1. To teach the students about different weather concepts.
2. To create a unifying theme throughout the science circus to create a better understanding of the concepts for the students.
3. To practice the classroom management skills that we learned in a previous teaching experience.
4. To give clear directions to the students at each step of the lesson.
5. To allow the students to be responsible for their own learning experience (Burry-Stock Category I: A).
6. To encourage students to actively discuss the topics and make predictions about the activities presented in the circus (Burry-Stock Category I: B).

How Goals Were Met (did we meet our goals)

Jennifer's and Shally's Learning Cycle:

1. We created three different stations to keep the students engaged in learning.

2 We were friendly and positive when teaching. We were excited to be in the kindergarten classroom and were engaging. We also used the students' names to create a stronger interpersonal relationship.
3 We learned about how to manage a primary grade classroom. During our lesson, we had trouble gaining the students' attention. At one point, Mrs. Cline used a bell to call the class to stop talking and listen. We learned to apply those skills to our science circus.
4 Because we went down to a primary grade, we learned how to keep science simple, but accurate. We really had to search for simple terms to use when talking about water. While Shally still focused on particles, she did so in a way that was active and engaging.

Younghye's Learning Cycle:

1 I presented materials for experiments and had the students make predictions about possible results of experiments, and provided opportunities to briefly investigate materials before experiments in order to promote the students' interests and engagement in experiments.
2 I had the students observe changes of states of matter in experiments. For the first experiment, I could not allow group discussions due to the lack of time, but could have the students share their observations with the class. For the second experiment, I had the students share their predictions and observations with their partners. I could not spare much time to share their ideas with the class. Instead I mostly explained what happened in the experiment.
3 During the half of the lesson, I attempted to manage the class with a stern voice while keeping friendly attitudes to individual students. But I found myself feel upset when I made the stern voice to discipline the class. During the other half of the lesson, I tried a different technique, saying "Cla~ss" with a delightful voice to quiet down the students and to get their attention. This managed the students well and helped me maintain good relationship with them.
4 Before the lesson, I numbered and highlighted directions for each step. I managed to give the students directions step by step. But I learned that I did not give clear directions for every step when I saw a group of students flip their beakers upside down and another group of students mix up the plastic wrap from the hot beaker and the one from the warm beaker.

Science Circus:

1 We wanted the students to learn about weather concepts on their own. However, some of the materials at the stations did not allow for the active learning. For example, Jennifer lost power at one station during the circus. While she used quick thinking, she had to step in and fix the problem. Shally also had trouble at one of her stations. She quickly realized that the container of water was too heavy for the students to carry independently.

Therefore, she had to fill, clean, and carry the water to the station to prevent spills and slips. In addition, she realized that the gel food coloring would not dissolve. Since she did not want the students shaking the container, she used her finger to quickly dissolve the gel food coloring.

2 We had a unifying theme, occurrence and change of weather conditions, throughout the science circus. Two demonstrations and five stations had the students observe, recreate, predict, and measure weather conditions and weather change as follows: The students observed cloud forming, predicted weather change based on different clouds, measured wind speed with two different anemometers, recreated updrafts (which would suspend rain and hail), simulated the warm air meeting the cold air as well as falling of raindrops from a cloud, and related evaporation and condensation in a cup of hot juice to the concepts learned throughout the science circus.

3 We applied the management techniques that we learned in our learning cycle lessons to the science circus. We used a timer to keep track of the specific time allotted for each station. We also used a similar pointing technique to move stations.

4 We gave directions on where to sit for demonstrations. We gave directions on how to move from one station to another before letting the students go. We provided written directions on each station and attended the students at different stations to give additional directions when needed. At each transition time, we gave directions to move stations.

5 We provided opportunities for the students to conduct experiments on their own. We provided directions, worksheets, and guiding questions to facilitate them. But individual students were responsible for attentively participating in and actively learning through experiments.

6 We prompted the students to talk about the topics by giving them guiding questions at their stations. Throughout the circus, the students were discussing the topics. While we may not have witnessed the open discussion firsthand, we saw the students talking and making predictions in our video.

What You Plan To Do Now

We plan to remember that science does not have to be about worksheets. Science can be active and engaging and can focus on inquiry and student directed learning. When we student teach in the spring, we plan to incorporate these hands-on, inquiry based methods into our classrooms. We also see the need to plan a lesson with appropriate amount of activities and worksheets in the future. We hope to take wait time as well as unexpected time wasters and allotted time as well as students' grade into considerations when planning a lesson and a worksheet respectively. In regard to classroom management, we will continue to incorporate the Burry-Stock ideas into our classrooms. Our students do not see much hands-on science in the classroom. They focus on worksheets and interactive notes. Consequently, when they are given an opportunity to participate in hands-on science, many do not know how to properly behave.

They want to play and talk. Because of this, we plan to model scientific discussions in the future where the students can ask questions and express their ideas in a safe classroom environment. We also hope to incorporate student directed learning, where the teacher is primarily a facilitator. While direct instruction is valuable and necessary, it does not have to take control of every lesson. Sometimes the best learning occurs when students think and hypothesize about a topic. They can talk with each other about scientific phenomena and make predictions about what they are learning. They can design their own experiments and record their findings.

Individual Reflections

Reflections on Learning Cycle Lesson

By Shally Ackerman

On Monday, October 15, Jennifer and I taught our learning cycle lesson on water phases to Mrs. Cline's Kindergarten class. Being placed in fourth grade made it challenging for us to think of lessons that were appropriate for kindergarteners and were at a level that they could understand. Mrs. Cline also told us that this part of the SOL and this property of water was the hardest for kindergarteners to understand.

We created our lesson and worksheet and sent it to Mrs. Cline in advance to inform her about our ideas and our plans. We separated the lesson plan between the two of us and each brought different materials. We met before our lesson to prepare for the lesson and then walked down to Mrs. Cline's room.

Luckily when we arrived the children were busy. She told us that we have a few minutes to set everything up and told us that we could move furniture if we needed to do so. We set up our three stations and asked the teacher's assistant to watch one of the stations for us. Our plan was to have three explorations stations set up for all of the students to explore. This gave the students an opportunity to talk in a small group and allowed for more direct supervision. Jennifer started the engagement part of the lesson plan by focusing on what the students knew about water and the three phases of water. She talked and asked questions about steam, water, and ice. She engaged the students by explaining that Mrs. Cline had told us that she had some really good scientists. She explained to the students that they would be looking at different materials and talking about what they saw to explain the different phases of water. She really got the students excited about what they were going to do and brought science down to a kindergarten level without compromising the integrity of the science itself.

I introduced the three stations. I tried to be exciting when I was giving a few directions. I told the students what they would be doing at each table but did not tell them what they were going to be observing. Once I was finished, I put the students in three groups by counting off. There were about 6 students in each group. We then went to our stations. Jennifer focused on one station while I focused on a station in which the students were to have an melting race. We gave each student a cup, a baggie with 2 ice cubes, and a paper towel. I asked the students to think about how to melt the ice. Many of them said to leave the ice in the cup. I asked them if they thought rubbing it would work. I rubbed my ice and showed them what happened. We then had a

race to see who could melt their ice cube the fastest. Their hands got very cold but they still participated. When we were done melting the ice, I asked the students what happened to the ice. They said that it got smaller and disappeared. I tried to correct their misconception by showing them the ice that was in the cup. I poured the water out of the cup to show them that the ice did not disappear but melted. I asked them what did the ice turn into and they said water. So I told them that the ice went from a solid to a liquid. These students got to see a change occur right before their eyes.

We then changed stations. I stayed at the ice race for the second transition so that I could be videotaped. When we changed for the third and final time, I switched to the observation station so that we could capture student responses. At this station, we gave students two pieces of ice in a baggie, a paper towel, and a cup of water. We told them that they were going to look at ice and water and talk about the differences between the two. They gave a lot of good ideas by saying things like the ice was hard and cold. I asked then which was colder the ice or the water. They placed their fingers in the water and said that the ice was colder. They hit the ice cube together, which made a noise. I asked them if they could do that with water and they said no. One boy put his water in his baggie. While I did not instruct him to do this nor did I anticipate this, I thought it was a great idea because they could see how water moves around and how ice is hard. They also had purple paper towels and of course put them in their cup of water. They could see how color transfers into the water.

Once everyone had a chance to see every station, we called all the students back to the carpet. I talked to them about how water is made up of tiny particles. Then to make this more concrete, I asked them to find a partner. We then acted out the different phases of water. They were still with their partner for solid, waved their arms for a liquid, and danced around for gas. Once they understood what we were doing I played with them a little and tried to trick them. I would say ‘show me a solid like ice’ then try to trick them by saying ‘show me a gas like steam.’ With their full attention, we also talked about what they saw in the stations and where they thought they saw water in their daily lives. Once we were down discussing, we passed our construction paper and a sort. They were given pictures of water in all of the different stages and had to glue them into the correct categories. All of the cutting was down before the lesson so all the students had to do was write their name and glue the pictures down. We walked around and helped the students with the sort. Some finished before lunch. Mrs. Cline said that they could finish it after lunch.

Overall, I think the lesson went well. It was an interesting experience teaching kindergarteners. But they were so enthusiastic about us being there and learning. I learned how to keep science accurate but at the same time simple. At one point, I was worried that our science exploration was too simple. However, I learned that it was just right for kindergarten students. I think I would change the order of the explanation section. We started it by talking about how particles make up water and ended with water in everyday life. It might have been better to put the discussion about water in everyday life at the beginning of the explanation.

My goal for next time is to relax more when I teach. I tend to get nervous sometimes because I don't want to tell the students the wrong thing. However, I think through doing different assignments that I will continue to feel much more comfortable in front of a classroom before this semester is over.

Reflection of Science Circus

By Shally Ackerman

On November 2, 2012, Jennifer, Younghye, and I did our science circus with my students at DJ Montague. My CT, Angel Washington, and I coordinated the time and date and she even set it up for us to work in an empty room. This really allowed us to take our time setting up the class and make sure that everything was exactly how we wanted it. We also did not have to set up around my students and did not have to rearrange Mrs. Washington's room. This also allowed Mrs. Washington to continue teaching and testing.

We set up all of the stations and reviewed how we were going to run the circus. Mrs. Washington brought my students down to the extra classroom a little late, so I knew we were under some time pressure (And I also knew that she had to give another word study quiz after the circus and before school was over). I told my students to come into the classroom and sit on the carpet on the floor. I introduced them to the circus briefly by telling them that we were going to focus on weather and do different activities. Then I told them that Younhye was going to do a demonstration and I let her take over the circus. After Younghye finished her demonstration and discussion, I told the students about each activity and the numbers of each station. I also told them to follow the directions on the sheet and that they would have a 6-minute limit. Since they were my students, I placed in groups. I tried to keep friends in separate groups (I did not want any silly or goofy behavior), tried to have an equal amount of boys and girls in each group, and I tried to separate the academic achievement ability (this allowed for differentiation within the groups).

During the circus, I stayed with two stations: the thunderstorm and cloud stations. The students seemed to need more direction and help at the thunderstorm station. I did not want the students to drop an entire tub of colored water on the floor. So, I filled the tub with warm water and dumped the color water out for the students. I let them read the directions and let them place the blue ice cube and the red food coloring in the water. However, during the first rotation I noticed that my gel food coloring was not dissolving as fast as the blue ice cube so I stuck my finger in the red food coloring and made it dissolve. I did not want the students doing this because they would probably shake the container and ruin the observation. The students at the cloud station seemed to have a better control over the directions. Also, Mrs. Washington helped the group that only had three people in the group. However, I did notice that some students did not follow the directions at the cloud station. They did not count the drops of water or simply squeezed the water from the eyedropper into the cloud. The students seemed to be very engaged in these two activities.

After the students had time to go to each station we told them to sit back on the carpet and quickly tried to explain all of the stations and do the engagement. I feel like overall the

explanations went well. I think I could have done better on mine. I meant to describe the connection between the two stations I worked on however, in the moment of explaining, it completely slipped my mind. Overall, I think the circus went well. However, I think that I like the learning cycle lesson better. While the students have a chance to explore concepts in both the circus and the learning cycle, there seems to be more control over the classroom when the students only have one exploration station to work on and not 5 different exploration stations. But, my students had fun and I learned a lot about classroom management and science.

Reflection of Learning Cycle Lesson

By Younghye Bessette

My goals were to try to direct students step by step and to manage their behaviors. In order to achieve these goals, I numbered and highlighted sentences to guide me step by step. Also I tried not to explain a whole lot of directions at a time.

My CT's class gets 30 minutes of science and I ended up teaching science for two day to cover a full learning cycle lesson. This is partially because my CT wanted to use a little bit of my teaching time to finish up her routine but mainly because time given to science class is 25 minutes shorter than math class. So my lessons were on the 25th and 26th.

I started the 25th lesson with reviewing concepts discussed in the activity from the previous lesson. At first, I asked open ended questions such as "What is a solid?" and "What is liquid?" One student answered that a solid does not break when you throw it hard. Because it was a review time, I quickly corrected his misconception and started to give guide questions, which were not open ended. That day's activity was on evaporation of hot juice. I wanted the students to know that matter changes its state and addition of heat energy helps liquid to become gas. The students were interested and engaged in the activity. They had opportunities to look at a beaker of hot juice and another of warm juice. Then they were asked to draw a picture of what would happen when covering the plastic wrap over the beakers. Some students shared their predictions with the class but I did not give them time to share ideas in pairs of groups because of the lack of time. During the activity, I managed to give the students directions step by step. But I found that one group of students flip the beakers upside down. I learned that I need to give more explicit directions with telling what not to do as well. After passing around the plastic wrap to investigate, the students were asked to draw what they observed again. At this point, I realized that I did not tell the students which wrap to pass around first. And this led them to mix up the plastic wrap from the hot beaker with the one from the warm beaker. I walked around and asked about their observations. After observation and drawing of observation, the students had opportunities to share their ideas with the class. Again, I did not give them chances to share ideas within groups.

The lesson on the 26th went better. I started the lesson with reviewing what we did on the 25th. I asked the students what they saw and drew pictures on the board to explain better. But I wish I had used examples the students could relate to. As I introduced them that day's activity, I told them they would receive their own ice cubes to investigate if they behaved well. The activity was on condensation with colored ice cubes. First I walked around with a beaker of purple ice cube, another beaker of green drink, and the other beaker of purple drink. Then, I asked the students to tell me what they saw. Then I told them that I would pour the green drink into the beaker of ice cubes as tilting the beaker of green drink toward the beaker of ice cubes. The students became excited. I asked them to think about what would happen.

Then I paired them up and asked them to tell their partners what they thought would happen. I walked around and asked students who were not paying attention to talk to their partners. I waited for them to share their predictions. After we briefly share some ideas with the class, I demonstrated what to do to set up the experiment. Once each group set up their beakers, I handed out small containers and ice cubes to explore. I did this to earn some time for the beaker of ice cubes to condensate the air enough to be visible. Once the beakers were ready, I told the students to unwrap the beakers and pass around the plastic wrap to investigate. Then I had them to share their observations within groups.

Unfortunately I had focused on the students' experience with materials too much to spare enough time to discuss what happened. We had time to share ideas, but I had to step in and gave the students guide questions that are not open ended to explain concepts.

I think it is really important to walk students through an activity step by step to avoid confusions. I did not do a perfect job, but I did a better job. I will keep this and work on it more. Also I would like to keep the way I gathered attention on 26th. At first I counted down to get the students' attention and found myself getting upset that the students got distracted so often and so much. On 26th, I had another moment of frustration and anger. And I decided to call on the students with delightful voice instead of counting down with stern voice. I said "Cla~ss~!" and the students answered "Ye~s~!" It was interesting how the students picked up how to react right away and then paid a lot more attention to me when I was nicer.

I learned that I do not smile much and that I look unhappy and upset when I do not smile. And so I will consciously try to smile a lot next time I teach. I also learned that teaching science is not just about fun activities. It is about helping students to investigate real things to come to understanding of new concepts in natural world. And the teacher's job is to guide them to learn by themselves. Thus I will spare more time for pair, group, and class discussions and ask guide question that are open ended more. Also I should minimize materials used in an activity next time.

My goals are now to ask many open ended questions that will lead students to understanding of concepts on their own and actually spare time to do that during a lesson.

Reflection of Science Circus

By Younghye Bessette

My goals were to successfully complete two demonstrations and to guide students at Station 1. In order to successfully complete demonstrations, I hoped to explain steps of demonstrated experiments one by one and ask open-ended questions. As for the station activity, I hoped to assist the students with questions to guide and redirect the students.

After Shally introduced me to the students, I demonstrated a cloud-making experiment. For both demonstrations, I needed to heat liquid. And it was very helpful to have an electric portable range. With already heated water, I started to demonstrate an activity. It was not as easy as I thought to going through steps of demonstration, explaining what I was doing at each step, and asking questions during and between steps of demonstration. When I first asked the students if they thought it was possible to make clouds, I had received unexpected responses. I thought that the most or many of the students would say that it is not possible to make clouds. But almost all of them expressed that it is possible to make clouds. And many of them told me where they saw people making clouds. I learned that I needed to prepare for any situations and not to assume to receive only certain reactions and responses from students.

As the experiment unfolded, I realized that something was wrong. For some reason, clouds were not forming. I was panicked for a second. But soon I tried a slight different approach: I sprayed an aerosol in the water instead of in the air inside of a jar. I had tested both approaches and both worked. I believed that spraying the aerosol in the air would demonstrate how clouds form better. But that approach did not work during the lesson and so I switched my approach. I learned that it is important to have back up plans even if they are not as good as the plan A. Fortunately the students were happy to see clouds forming and some of them offered their ideas about what happened in the jar. One student used a term dust particles to explain what happened. And some used a term, evaporation. The experiment ended. I was happy that the students had a lot of prior knowledge since they had completed a unit on the weather. But I was unhappy with my stuttering and English. I learned that I become nervous when teaching new students and that my English gets much worse when I am nervous. Thus I will need to practice what to say much harder next time I teach.

After this demonstration, the students were sent to different stations. I took care of Station 1. When I designed Station 1, I revised materials, worksheets, directions, and procedures a lot. But I still found out that the station was not designed well enough to walk the students through smoothly. At first I planned to have the students use two cloud photos and then cut the number of photos to one. Yet some students were not able to go through two steps of the activity, and almost all students were not able to complete their worksheets. I learned that the students need a lot more time than I thought to complete an activity. The students did not read the direction and I had to tell them what to do next step by step. The students were given 6 minutes at each station and the activity at Station 1 needed more time than 6 minutes.

As more groups of students came to Station 1, I realized the orientation of materials on the station was not most efficient. I made an adjustment for laptops. But with that adjustment, taped directions and data were not in a right place anymore. I learned that I need to consider designs not only for an activity itself but also for setting of activity materials.

Once the students went through all the stations, the explanation portion of the lesson began with my explanation on Station 1. Because some students did not get to explore the weather report website, I briefly gave them information on reported weather. Then, I asked if their predictions were matched. And it turned out that almost all students' predictions were matched. This may have resulted by certain photos most students picked. I prepared 12 photos of clouds of several kinds. And many students preferred photos of cumulus or cirrus clouds. For these clouds, it was easy to predict sunny weather. I should have provided one photo for each kind of cloud and then separated them into two stacks so that at least one pair in the group would have chosen a photo of clouds other than cumulus or cirrus.

During the explanation, I asked other questions. One thing I wish I had asked is what properties and characteristics they had considered to identify clouds and predict the weather. Instead, I briefly asked if they had learned and used properties and characteristics of clouds to predict the weather. I learned that I can forget important questions when I am nervous.

The Science Circus ended with my demonstration of another experiment and exit cards about that experiment in relation to one of the stations. For this demonstration, juice was pre heated. Again, I went through the experiment, explained what I did step by step, and asked questions. Because the heated juice needed time to evaporate, I asked the students to predict what would happen and share their predictions with their neighbors. The students were more engaged in this experiment than the first one because I gave them chances to discuss with their friends and also told them that they would get involved by looking at, touching, and smelling the plastic wrap to determine where the water droplets came from. The experiment ended fairly well.

Not all the goals I had for this lesson were met. I did not ask many open-ended questions for demonstrations. Also I did not guide or redirect the students with questions at Station 1. Instead I told them what to do next at each step. I will change either the number of stations or the content of Station 1 because 6 minutes for each station was not enough for Station 1. Also I will cut out more parts for writing on the station 1 worksheet because experiencing is more important than recording detailed data. But I will keep the concept for Station 1. It is a good concept. It needs some adjustments to be simpler and take less time to complete. I will also keep the procedures of two demonstrations. The demonstrations were prepared well in advance and explained step by step. My goals now are to prepare more detailed scripts for teaching and to practice what to say much harder so that I would not stutter with bad English even when I am nervous with new or inattentive students.

Reflections on Teaching a Learning Cycle

Jennifer Massengill

In teaching a learning cycle lesson in Kindergarten, my main goals were to get a grasp of what science is in the primary grades, and to develop a lesson that presented the information in a way that made sense to a Kindergartener while still being engaging.

Mrs. Cline requested that Shally and I address the water SOL, specifically the 3 states of water. She advised us that we would have about 20 minutes to get our talking done, then we needed to move on to activities. I find it easier to work with this age in small groups so we used the small group approach to the activities. Large group time was used to engage the students as scientists, telling them we needed help learning about water and that when scientists encounter something they're unfamiliar with or want to know more about, they investigate, ask questions, and remember what they learn so they can share their findings with others. We then looked at water, ice, and steam, identifying them and what they have in common.

Our small groups looked at water in three different ways: one was a straight exploration using their senses. We gave them their own ice and cups of water so they could use all 5 senses without worrying about spreading germs. We didn't have an observation sheet since there weren't any writers in the class and I couldn't figure out how to have them draw things like "hard", "cold", or "wet" without giving them the words and thus limiting their responses. Instead we asked them to remember their observations until they could share them during the

explanation in large group. The second station was to show that water changes form with the addition (or subtraction) of energy. The experiment was adding energy to ice cubes to get them to change form from solid to liquid. I was hoping that students would try different methods of adding energy like holding it against their belly, rubbing it between their hands, or even breaking it into smaller pieces. By racing to melt the ice cube, we would see which way did the "best job" of transferring the energy. I understand that all the students added energy by rubbing their hands together so that part of the experimentation didn't work out. The last station was to compare water, ice, and a balloon representing air to see if they could change shape when they changed containers. The students identified what shape it was when it started and predicted what shape it would be when we moved it to a new container. I knew this was our most abstract and thus weakest station, but the kids had fun handling the big shapes of ice and pouring water from one container to the next. Some kids quickly caught the concept that solids stay the same, liquids change according to their container; others had a surprisingly difficult time with it.

During the explanation stage we returned to large group and reviewed what the students discovered during their stations. Shally got the kids moving again and reinforced one of the properties of matter by having them act out being a solid, liquid, or gas, with solid being still, liquid flowing gently, and gas going everywhere.

The extension returned to the question of why we should learn about water in that it is all around us. The students did a sort of different images of everyday water in the different forms of solid, liquid, or gas.

Overall I think the lesson went well. The biggest thing I learned is that I need a timer or an independent timekeeper because while I looked at my watch as we started the stations, I promptly forgot what I'd seen once I was busy with the kids. Because Shally and I were sitting with our backs to each other, I think we each spent time waiting for the other to finish up when in fact, we were ready to switch. That made us run over and made some of the stations drag. If I were to do this lesson again, I'd still like to find a replacement for the last station. Also I'd want to make sure that I was very conscious of using the terms solid, liquid, and gas at all three stations to reinforce the ideas since we ask them to identify the stages in the final sort.

Finally, I have to thank Alex for taping our learning cycle. He did an excellent job and allowed us to focus on the students without having to worry about the camera.

Reflections on Teaching a Science Circus

Jennifer Massengill

Shally, Younghye, and I taught a science circus on weather to a fourth grade class at D.J. Montague. The students had already completed their unit on weather so they came in to the class with background knowledge suitable for their age. The SOL we were addressing was 4.6: The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include

> a) weather measurements and meteorological tools (air pressure – barometer, wind speed – anemometer, rainfall – rain gauge, and temperature – thermometer); and

b) weather phenomena (fronts, clouds, and storms).

Younghye opened the lesson with a cloud making demonstration. It was unfortunate that when she asked the students, “Do you think that it is possible to make a cloud?”, most of the students said “yes” – apparently they had seen it done in a previous class. Nevertheless it did a good job of getting the kids in the mindset of examining different weather phenomenon and then questioning how and why they happened.

We used 5 stations: predicting weather based on clouds, using an anemometer and calculating wind speed, suspending Ping-Pong balls using the Bernoulli effect and simulating hail in a storm, making a thunderstorm (which really demonstrated fronts), and estimating and experimenting to determine how much water a cloud (cotton ball) can hold before it starts to precipitate. These were chosen to work together. For example, students saw how updrafts could suspend hail or rain, which in turn would affect how much a cloud could hold before it started to precipitate. The updraft would occur when two fronts came together and the effect of the updraft would be influenced by the wind speed which the students learned to calculate. Finally, students got to practice predicting the weather through looking at clouds, then got to check their accuracy because they could compare their predictions to the actual recorded weather for the day the photos were taken.

Younghye handled the extension activity, using heated and room temperature juice to help demonstrate evaporation. While students have often seen condensation on the lid of a heated liquid, Younghye used a strong-smelling juice so that the students could smell that it was actually the juice itself that evaporated and then condensed, rather than the moisture coming from somewhere else.

Overall, I think the circus went well. We lost power in the middle of a rotation at the anemometer and Ping-Pong stations which made things a little tricky until I found a new socket that worked. The kids seemed to enjoy themselves and transitioned well from station to station. On the other hand, they often we so eager to start experimenting, it was very challenging to get them to read the directions. We used questioning during the forum time to help them see the connections between the stations and develop a larger picture of weather phenomena and predictions, but a limited number of students participated. I think that while the students had fun, the lesson’s value was limited by the fact that the students have already finished their weather unit so there probably won’t be a whole lot of follow up and reflection on what they saw and did. I think I would use this again in the future, but would want them to have a follow-up activity which would require each student to relate what they learned individually. Ideas that come to mind would be to write either a factual account of how the stations work together and to tie it into the water cycle, or to write a fanciful account, perhaps from the point of view of a water drop that is caught up in the different weather phenomena, again incorporating ideas and vocabulary from the different stations and demonstrations. The more visually inclined could present a news report as if they were meteorologists, using visual aids to explain what they have learned.