

Unit Plan and Student Learning Assessment and Reflections

Jamie Follin

Introduction

This science unit covered the following topics: (1) history, methods for, and purposes of classification (2) the integration of technology, science, and society, and (3) in-depth explorations of viruses, protists, fungi, and plants, including how each affects and is useful to humans. Viruses were included in this unit because they do share some traits with living organisms and are still given a classification system even though they are non-living. Additionally, along with the six living kingdoms, viruses are included in Standard BIO.5 of the VA Standards of Learning.

Reflections and Evidence

Lesson 1 – Introduction to Classification (2/20/06)

This introductory lesson began with an engagement activity that asked students to come up with a way to group specific items, living and non-living. Its purpose was to show students the many criteria that can be used to classify organisms. The students did well with this and I feel it adequately grabbed their attention. In the future, I would ask them what they learned from the engagement activity instead of telling them why I chose to have them do it. The rest of the lesson focused on the PowerPoint and corresponding note-taking outline. I was satisfied with the depth of the material but I would change a few slides. Some included unnecessary details and others did not exactly match the notes outline, which left some room for confusion. I feel that providing students with an outline of their notes is important because this keeps students engaged, is time-efficient, and provides a framework to follow that is especially helpful to students with writing disabilities and/or language barriers. Some students typed directly into the electronic copy of the notes online and any time students use computers, it is important for teachers to consistently

monitor for abuse of privileges. But I do feel that providing options for how student want to take notes is important. I would also revise two of the follow-up questions that required the use of the Internet in an undirected manner. It is more efficient, as well as safer, to instead provide students with specific links to follow. In the future, I would also provide hard-copy resources in case we experienced technical difficulties with the Internet/laptops. The notes and follow-up questions were graded for a total of 24 points. This gave them an easy grade, which could be good at the start of a new unit (or teacher, in my case). However, that was over-emphasizing the notes since the follow-up activity ended up counting one point less but took much more effort to complete.

Lesson 2 – Shark Dichotomous Key Activity (2/21/06)

For this activity, I provided students with the scenario that they were government-employed shark biologists called in to identify a shark in the coastal waters off Brazil. This was much more interesting than simply completing the shark dichotomous key, which they had to do in order to become an “expert.” They were then asked to extend their learning by first identifying the unknown shark from photos taken by the “locals” and then by proposing an action plan to local officials. The introductory portion of the lesson (before the activity got underway) got progressively smoother throughout the day. I found it helpful to add an additional page into the packet which clarified the scenario and objectives and provided a space for students to record their proposals. The beginning classes were only shown PowerPoint slides of the scenario and asked to write on the back of their sheets. This caused me to answer a lot of the same questions over and over, which was not the case once I added the additional page. Also, I used the Smart Board to review fin locations in the later part of the day which I think was more helpful than my just pointing them out on the projector screen. The activity went very well and it was easy to keep students engaged. Mr. Pratt made two additional helpful suggestions. He pointed out that

the movie “Jaws” was based on the same scenario of a scientist being called in to identify a shark of concern, so it may be fun to show a clip where the scientist gets called in and uses scientific terms. Also, again, it would be helpful to add specific links that students should use to identify the shark and gather life history information. This way their surfing is more directed.

This activity met two of the overall goals for this unit. First, it was important that students learn how to use a dichotomous key. Second, students needed to understand purposes of, and methods for, classification. The student activity sheet provides evidence that both goals were met. Students successfully identified most, if not all, of the fourteen species of sharks. Thus, students knew how to use a key and understood that the purpose of a key is to be able to distinguish between different species of closely-related organisms (in this case, sharks). Additionally, students identified different features that can be used in classification (for sharks this included number of gills slits, presence/absence of anal fin, body shape, mouth placement, etc.). Also important to any science curriculum is emphasizing the nature of science. In this activity, students were required to construct and defend a scientific viewpoint based on observations and scientific information, just as a real scientist would do. Students’ writing pieces offer evidence that students engaged in the true nature of science ([See Attachment A](#)).

Lesson 3 – Create Your Own Dichotomous Key (2/22/06 – 2/23/06)

The first part of this activity, creating Latin names, went over pretty smoothly with students. It was good that I provided a few examples of what Latin names translate to in English so that students could see that organisms are often given names based on obvious traits. I also thought that pointing out that new species had just been discovered by scientists in Papua New Guinea was important for students to understand the relevancy of the activity. However, instead of saving the entire article with pictures I should have set the photos up in a PowerPoint or word

document on their own. Providing the scenario in which students were part of a collaborative scientific team that had just discovered new species in the Roanoke Valley again provided relevancy. One improvement needed would be to decide how students should share their created names. One student with poor writing skills had a particularly difficult time writing both of the names his group came up with on the Smart Board. I could have had him write just one name and then chosen another student to write the second name so that the rest of the students didn't drift off. Mr. Pratt encouraged me to take the created Latin names from students in the last period of the day and write them on the Smart Board myself. He encouraged adapting lessons to the students in each particular class, stressing that the last period of the day would not handle writing the names on the Smart Board themselves like the first period did. I feel this worked very well and students remained engaged. Also, as one student read their name aloud, other students were able to copy it down at the same time I was writing it on the board. The last improvement that comes to mind would have been to add a few more Latin roots on the handout, such as body (*corpus*) that would have proven useful.

I should have been much more prepared for the second part of the activity (creating the dichotomous key). I failed to put myself in the shoes of the students and therefore did not provide ample explanation and guidance from the beginning. Instead, I felt as if I walked around the room trying to "un-confuse" students. Next time I will make sure students understand the process they should use in order to set up a key (how a key works, how to use distinguishing characteristics, how to start classifying organisms, etc). Another issue that complicated the lesson was my unfamiliarity with the Smart Board. I often couldn't find the files I wanted, accidentally erased my writing on the board twice which severely hindered the lesson, and students easily drifted off while going over examples of the keys students came up with. I had a

lot of resources that I wanted to refer to during the lesson, but was not adequately prepared to make smooth and meaningful transitions, which led me to often leave resources unused.

However, overall, I feel the students benefited from experiencing how a biological key is set up and then used to identify a particular species.

This activity met two of the overall goals for this unit. First, it was important that students know how to create a dichotomous key. This enhanced their understanding of how a dichotomous key works as well as increased appreciation for this vital scientific skill. Second, students needed to be able to explain the concept behind binomial nomenclature. By creating their own names, they were able to personally experience how scientific names are developed and thus understand that species' Latin names have significant meaning. Again, important to any science curriculum is emphasizing the nature of science. This was accomplished in this authentic activity in which students were part of an exploration team that had just discovered new species in the Roanoke valley and were responsible for naming and classifying them. The student activity sheet provides evidence that all of these goals were met ([See Attachment B](#)).

Lesson 4 – Introduction to Viruses (2/27/06)

I thought that using clips from “Outbreak” was a great introduction to viruses. However, I had to rent a VHS because that was all that was available and because we only had a VCR in the classroom. In the future, it would be ideal to use a DVD or edit clips together. That way, transitions between clips run much more smoothly during class. I used a timer on the VCR to proceed through the clips but this proved to be very difficult, especially when the counter stopped working for some reason. However, I proceeded to describe the clips to students and ask them questions and eventually Mr. Pratt located the correct clips. My “stalling” was successful, as students stayed on track. In the future, I should add more questions to the supplemental

handout so that students are engaged during the “down time.” The PowerPoint that introduced viruses focused on the basics, which was appropriate. I thought it was good that I gave examples of how viruses affect humans, asked students to interpret a map, and showed them a clip demonstrating virus reproduction (although a more visible clip would have been more effective). However, I did have one entire slide that did not have corresponding notes to it and I could see students’ attention drop off. Again, I need to make sure to cover all slides in their notes. Lastly, I need to make sure to officially close each lesson with a brief review.

Lesson 5 – Virus Life Cycle and Disease Spread Gizmos (2/28/06)

The “Virus Life Cycle” gizmo was an addition to my original unit plan. I found that students did not have enough time to complete both online activities, found at www.explorellearning.com. Thus, I had to assign one of them to be done at home and some students ran into technical difficulties. In the future, I would concentrate on one gizmo or give students more time to complete the assignments in class. Also, my original activity sheet was very plain. This would not have been appealing to students. Mr. Pratt and I added a few graphics, increased font sizes where necessary, and added some final touches that made it much more appealing. In the future, I would edit the activity sheet to include only those questions that I felt were completely relevant since I felt there were some poorly-worded and/or poorly-constructed questions. In addition, I announced a few verbal instructions that in the future I would place on the activity sheet (and/or fix corrections so instructions were decreased). Also, it was important that I explicitly tie the previous day’s lesson in with the gizmos. I did not do this for the first class but made sure to do it for the remainder of the day. Doing this helped students thoroughly understand why the activities were important and relevant. Asking students to plot 3 different lines on the provided graph (on the activity sheet) was an excellent way to practice graphing and

interpretation skills. I will make sure to keep this part of the assignment in the future, although it does take time to guide students through the set-up. Lastly, going over the online assessment questions was an effective and useful elaboration/review tool.

This activity met two of the overall goals of the unit. First, it was important that students be able to summarize the distinguishing characteristics of viruses and explain their significance to humans. Second, it was necessary for students to understand why viruses are considered non-living even though they share certain characteristics with all living things. The “Virus Life Cycle” gizmo illustrated virus characteristics as well as how viruses are similar to, and different from, living organisms (contain nucleic acid but cannot reproduce on their own). The “Disease Spread” gizmo explored the impacts viruses can have on the human population. The student activity sheets provide evidence that both of these goals were met ([see Attachment C](#)).

Lesson 6 – Transmission of Disease Lab (3/1/06)

This lesson went extremely well. Students became immediately engaged and excited, and Mr. Pratt commented on his surprise at how involved they became. Wearing the doctor’s coat with the stethoscope, providing face masks, and using signs for “Quarantine” and “Doctor’s Office” was a great way to increase students’ enjoyment of the activity. They did not hesitate in answering the corresponding activity sheet questions and were actually quite interested in doing so. Providing a follow-up graphing assignment gave students additional exposure to this necessary skill. Planning was crucial in this lesson. I waited too long to gather necessary materials and therefore ran around the night before trying to get stuff together. That would not be advisable in the future. Also, Mr. Pratt was vital to the lab set-up. When I am on my own, I will have to set up all the cups in the morning so that they are ready to go for each class. Also, making sure all files were readily accessible, and that I was already on the necessary website,

allowed things to run much smoother (an improvement from other days). Lastly, students really enjoyed getting to use the Smart Board in class (to record their test results). This was an excellent way to allow every student to briefly use this technology resource.

This activity met one of the overall goals of the unit. It was important that students understand how science, technology, and society are often intertwined. Through this activity, students understood the impacts that viruses could have on humans, how technology could aid in the testing and/or prevention of disease spread, and how scientists use technology for the betterment of society. The student lab sheet provides evidence that this goal was met ([see Attachment D](#)).

Lesson 7 – Introduction to Protists (3/2/06)

In the first class period of the day, I ran through the material too quickly. I needed to announce exactly what we were doing, how it tied into yesterday's lesson, and give students time to get their laptops up and running so that they could take electronic notes if they wanted. I did add a quick section reviewing kingdoms, which I feel helped students follow the order of the unit. Also, Mr. Pratt suggested that I review with students the Latin roots for some of the words we were reviewing (ex. autotrophic). For the second and third class periods of the day, I made necessary changes (slowing down the presentation of material, getting students set up properly, etc). These two lessons ran much smoother and students were able to follow material much more easily. I was content with the corresponding PowerPoint for this lesson. Enough pictures were used to illustrate to students what protists were. I also incorporated a map showing the incidence of Malaria around the world, which students had to interpret and explain. Additionally, the PowerPoint followed closely with the notes outline so students could easily follow along. I left out one major point (defining saprophytic), which I then added for later classes. We decided to

show a “Bill Nye” video on algae for the second portion of the lesson. Although a good resource, students seemed to be over-inundated with these videos (from previous other Bill Nye video showings) and many became inattentive. The video was a bit corny for the high school level. I would show this video again if I had not shown many more Bill Nye videos before and I would also preview the video ahead of time so that students could be provided with an outline that they would have to complete as the video progressed. Lastly, I made a point to ask students if they had ever swam in the ocean after dark and observed green specks glowing in the water. I then told them that this was bioluminescent algae, thus allowing them to see that they actually come into direct contact with protists. They were very amused by this!!

Lesson 8 – Virtual Pond Dip (3/3/06)

Unfortunately, Mr. Pratt and I were both absent for this lesson. I did leave explicit directions with the substitute. This lesson, fortunately, was an “exploration” lesson and students worked independently using their laptops. The collected activity sheets showed that students put forth effort to complete this activity. However, in the future, I would more directly tie this lesson into the Hay Infusion that followed. For instance, students could refer to the virtual pond dip sheet to see what protists they found in their individual samples.

Lesson 9 – Hay Infusion Lab (3/6/06 – 3/7/06)

The samples used for this lab eventually rotted before the students made their observations. Thus, the classroom stunk and the existing protists were in the process of dying. In the future, I would make sure to put samples into clear containers and refrain from using so much hay. We decided to dilute the samples by adding distilled water and placing them into glass jars. We then collected stream water from outside of the school to provide an additional sample. Despite all of this, students were able to identify protists in all samples. On the first day of the

hay infusion, students were asked to examine samples of pond and stream water and draw observed protists. They were then asked to use a dichotomous key to classify the organisms they saw as well as identify modes of motility. I found that the provided dichotomous key was too difficult to use. Many of the initial criteria were hard to determine (such as whether the protist lived in colonies). A simpler key would have been much more useful. In addition, it was difficult in many cases to determine the mode of motility that a protist was using due to magnification constraints. I should have made expectations clear because students seemed concerned that they could not complete the task as required. In addition, many did not understand that they should illustrate just one protist they observed and not the entire field of view. Before the lab, I should have made it clear to students that the protists were feeding on the hay included in the sample. I could have then quickly reviewed the follow-up questions so that students understood how they were supposed to answer them (this would include reviewing the basics of protists). It also would have been helpful to examine the samples at length before students did because the first day I found myself still being unfamiliar with what students were seeing. Therefore, it was harder to help them. By the second day, it was much easier to assist students and I actually got more involved in the lab. This seemed to encourage higher student participation as well. The second day of the hay infusion went very well and most students stayed actively engaged. I provided students with an illustrated information sheet which made identifying protists much easier. It seemed that this allowed them to make more sense of what they were seeing. They also began to share their findings with others. Students discovered unexpected organisms (amoeba, macro-invertebrate larvae, etc.) and got really excited. During both days, Mr. Pratt and I hooked up a microscope to the Smart Board so that students could see a larger image of what they should be

able to observe. We then broadcasted interesting findings to the class. I would make sure to do this during future labs as well.

Quiz – Classification through Protists (3/8/06)

Students took an online assessment through Blackboard. For the most part, this worked really well. I was able to track responses, make qualitative and quantitative assessments (analysis provided by Blackboard), observe students' progress during the assessment, and completely randomize all questions and possible answers. This minimized cheating. However, Mr. Pratt and I encountered some difficulty when we discovered that some of the questions were marked as "Multiple Answer" instead of "Multiple Choice," which led students to mark more than one answer at a time. I then had to re-score results. We also realized, after the assessment, that some students might have had online notes open during testing. Although we circulated the room and saw nothing suspicious, I should have been more wary. In the future, I will make sure online notes are not visible on Blackboard during the assessment. Overall, however, I was very pleased with the actual assessment procedures and would continue testing using this method. As far as teaching methods are concerned, I would make a few changes. First, I would have students create a graphic organizer for protist classification (animal-like, plant-like, fungus-like and then breaking down those categories, such as animal-like into ciliates, zooflagellates, sarcodinians, and sporozoans). Many students remained confused of how various classifications related to one another (such as protist to algae). Second, I would provide more opportunities for reinforcement since students found this to be difficult material. This could be done by more thoroughly reviewing completed class assignments as well as by providing for an in-class review day or take-home review sheet.

Because of student test scores (see Attachment E), I allowed students with a failing grade to remediate with me before or after school for one day and then retake the quiz. They could then earn up to the lowest “C.” I remediated students for three days and went over study and test-taking skills and reviewed class material. Approximately five students re-took the quiz for a better grade.

Lesson 10 – Introduction to Fungi (3/10/06)

I spent the first part of the day reviewing the assessment from the prior day. I first revealed where questions were taken from (17 from the notes, 3 from online simulations, 2 from class video, etc). I analyzed results with them and reviewed questions that were especially difficult to answer. I pointed out common mistakes and gave tips for future test-taking. I also reviewed the questions that students did well on.

Students then watched a clip from TLC’s “Medical Miracles” that showed a man who was living with a condition received from a fungal infection. Students were shocked and engaged. I would show this clip again, but only to high school students due to the graphic nature of the video. This video was an excellent way to demonstrate that fungi can have a very negative impact on humans. Students were then assigned to complete an activity sheet corresponding to an online fungi virtual museum. This was an excellent way for students to work together to gather necessary notes. This assignment provided an alternative option to the traditional note-taking session. Students were engaged by the activity and a large majority completed the bonus question as well. One change that I would make to this lesson would be to review the activity sheet before collection, thus reinforcing the material. I did this with two of the classes but would like more consistency with the third class.

Lesson 10 –Introduction to Plants (3/10/06)

This lesson served to introduce students to basic plant characteristics and classification. Students were again provided with an outline to complete as notes. Although what I included was important, I found that I left out a lot of useful supplements (photos showing parallel and branching venation, flower part numbers, vascular tissue bundles, etc). Thus, what I had planned did not last nearly as long as expected. Luckily, students were able to complete the prior's day virtual museum activity. Mr. Pratt taught for the one period that had already completed the fungi assignment. He used the entire period and I was able to reflect upon my own teaching as well as his. Because of this, my final teaching of the day was much more comprehensive and enabled students to better understand the material. The most important lesson I learned was to make sure to incorporate numerous resources while creating slideshows. Lessons should not just include "pretty" photos and necessary text. Other illustrations are necessary to further enhance student understanding.

Lesson 11 – Plant Packet (3/13 – 3/16/06)

I wanted to expand on my original unit plan and also utilize an alternative teaching strategy. Mr. Pratt suggested I try developing a "plant packet" that students could complete at their own pace throughout the week. The packet included an online classification activity, two hands-on labs (examining fruits and flowers), and a final graphic organizer to complete. Those students that finished by Thursday participated in a fun review day outside with me while others finished their packets inside with Mr. Pratt. On Friday, all students took the online assessment. Students thoroughly enjoyed the hands-on labs as well as being able to work at their own pace. By signing off on each section, I was able to keep track of student progress. I also constantly walked around and monitored student learning to make sure students understood necessary concepts. Adding the graphic organizer to the packet helped students tremendously (as stated by

them). Without it, I feel assessment grades would have been much lower. The one downside to the plant packet was the lack of formal feedback to students. Their packets were due on the day of the quiz, therefore I corrected their work after they had already taken the quiz. Ideally, packets should be collected, corrected, and handed back so that they could then be used as a study tool. In this particular case, I worked so closely with students that I feel students received necessary feedback. But doing this may not always work and additional time may be needed between a packet due date and the assessment.

One goal was met through this plant packet week. That is, students were able to summarize the distinguishing characteristics of plants, as evidenced in the student plant packet (see [Attachment F](#)). Additionally, students were able to identify how plants are classified (seed versus seedless, monocot versus dicot, etc). This plant packet provided a hands-on approach to studying plants.

QUIZ – Fungi and Plants (3/17/06)

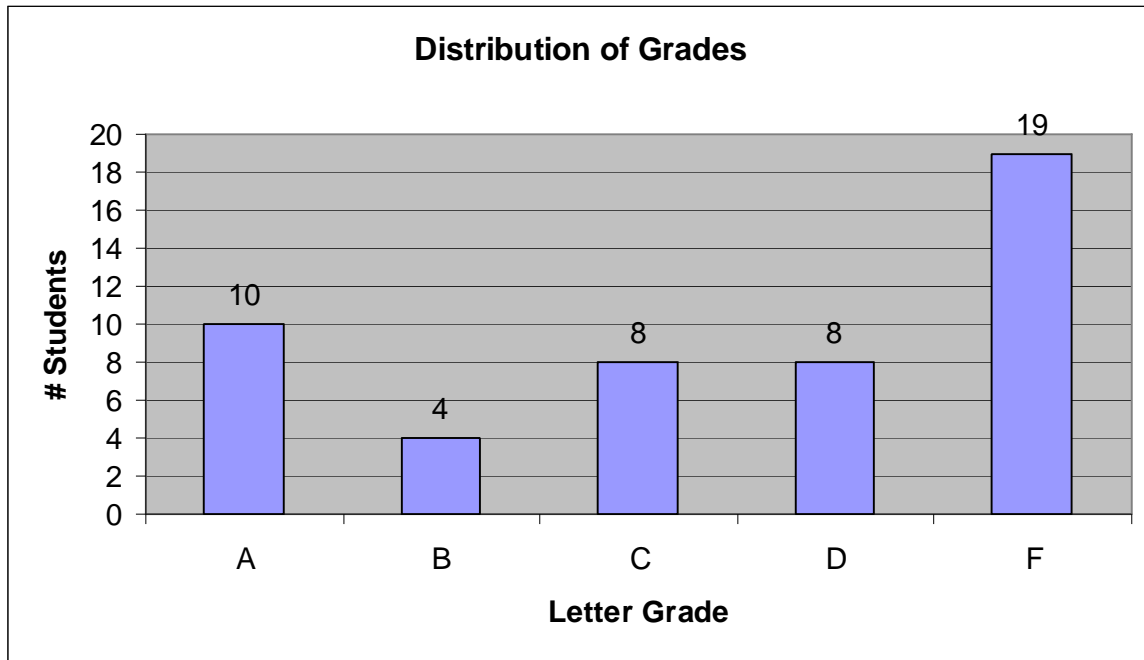
This assessment was taken online through Blackboard. Directly prior to the quiz, I reviewed important material with students, including specific concepts explored in their plant packets (specifically the graphic organizer). This was done in order to answer any last minute questions they had about the plant packet and/or quiz. My review concentrated on important “take-away” concepts. Since the quiz also focused on this, students found this to be a very helpful review. I did not, however, “review to the test.” Assessment scores reflected student understanding, and students commented on how effective the plant packet and quiz review were. Prior to giving the test, I made sure to proofread for any mistakes. I also made sure to make notes unavailable online during the quiz. Lastly, I randomized all questions and potential answers in order to deter cheating.

Overall Assessment

I feel that the classification unit was successful in providing numerous hands-on, authentic learning experiences. Many teaching techniques were employed, including teacher-directed instruction (lectures), student-led explorations (plant packet and hay infusion lab), video instruction (Bill Nye video, “Medical Miracles” story, “Outbreak” movie clips), technology-based instruction (online gizmos, virtual pond dip, and fungus virtual museum), and real-life simulations (spread of disease lab). Students were also given opportunities to engage in the true nature of science (naming and classifying newly-discovered species, making scientific recommendations based upon observations and scientific literature). Furthermore, classroom lessons progressed in a logical manner, from simple non-living entities to more complex living organisms. Students were assessed throughout the unit, not just through the two quizzes. Therefore, I feel grades accurately reflected student performance. I maintained focus on learning goals and objectives and consequently all were met by the completion of the unit.

Attachment E – Quiz Grade Distributions

Classification/Virus/Protist Quiz



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