Series:
M³: Making My Move

Lesson #5:
Moving On!

Teacher and Student Editions

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The School Career Resources (SCR) "Making My Move" is a series of five lessons developed for 5th to 8th grade students based on career pathways to help them begin to think about career opportunities. Each lesson utilizes the construction of an aircraft-related project to engage the students in career decision making. Each of the five lessons build off one another, so it is important to do them in sequence. However, if time is only available for one lesson, the first lesson is the most important. Each lesson can be taught by any teacher or school counselor; no prior knowledge is needed to successfully deliver the content. Lessons could be taught in transitional classes, classes where students are introduced to careers, homeroom sessions, classes that would involve students conducting self-reflection, social studies classes, etc. Honestly, this series of lessons could be taught in any upper elementary or middle school class, at any time. Each lesson was designed for one class period, but since they provide a rich context for elaboration, you may want to consider planning for two or more hours.

SCR 1: This lesson uses the construction of a hot air balloon as the vehicle for instruction and as a visual representation of student potential. In this lesson, students will explore their abilities and interests in the context of where they can go.

SCR 2: This lesson uses a dirigible or blimp as the vehicle for instruction and as a visual representation that careers can be selected and guided. In this lesson, students will explore how their abilities and interests can help them consider career areas; it is not intended that students will pick a career at this time. Rather, students will see how a plan is valuable for achieving goals.

SCR 3: This lesson uses the construction of a model of an antique airplane as the vehicle for instruction and as an example of skills and interests. In this lesson, students build a model airplane and plan an imaginary trip in it, drawing their flight path on a road map or an aeronautical sectional chart. Students "fly" the airplane on a string to experience that it can be controlled. The activities in this lesson provide a context to identify likes, dislikes, and skills, so students see how their personal beliefs lead to the identification of an appropriate career cluster.

SCR 4: This lesson uses a jet as the vehicle for instruction and as a visual representation of going fast, high, and far. This lesson was designed to help students in grades 5-8 expand their thinking about what is possible. Students build a model jet aircraft and decorate it to reflect their interests and values. Students fly the jet using a rubber band-powered launcher and adjust the control surfaces for a successful flight path. The activities in this lesson lay the foundation for a focus on matching careers to personal values, interests and goals. When an occupation/job is chosen based upon one's interests and values, passion, enthusiasm, and resiliency will be there for developing a successful, fulfilling career.

SCR 5: This lesson uses a rocket as the vehicle for instruction and as a visual representation of doing extraordinary things. Students design and build the rocket and then test it for stability before launching. Students also build a tracking device and use it to calculate the apogee (highest altitude). Students compare the tasks they completed in this activity to characteristics they feel employers need. Finally, students match employability skills with career clusters consistent with their interests.

Completing the lessons in the SCR "Making My Move" series will help to meet two Illinois PaCE (Postsecondary Career Expectations) requirements in the 8th grade individual learning plan:

1. complete a career cluster survey
2. complete a unit on education planning

See https://www.isac.org/pace/documents/pace-framework.pdf for additional information. In addition to helping meet the PaCE requirements, the SCR lessons address several Illinois Priority Learning Standards in English Language Arts, Mathematics, Physical Science, and Social Emotional Learning areas.

Lesson Overview:

This is the fifth in the "M3: Making My Move" lesson series designed to help students in grades 5-8 think about and explore possible careers extending into building a personal network to expand career options. This lesson uses a rocket as the vehicle for instruction and as a visual representation of doing extraordinary things. Students design and build the rocket and then test it for stability before launching. You will also build a tracking device and use it to calculate the apogee (highest altitude). Students compare the tasks completed in this activity to characteristics they feel employers need. you will connect the rocket experience with aspects of career selection and preparation. Finally, students come to realize that just like it requires a crew to launch a rocket, a network of like-minded professionals will help them obtain a successful, fulfilling career.

Classes or Discipline:

- Transitional classes
- Career based classes (i.e. Intro to Careers)
- Any class or subject involving self-reflection or planning for the future
- Social Science, Math, ELA, Science

Career Cluster:

- This lesson is applicable to all CTE Career Clusters

Illinois CTE Endorsement Area:

- This lesson is applicable to all CTE Endorsement Areas

Grade Level(s): 5th-8th grades.

Anticipated Days/Minutes: Approximately a 50-minutes class period but could be extended to multiple class periods if several academic standards are addressed.

Learning Objectives: At the conclusion of this lesson and activities, students will be able to:

- Use their abilities, interests, learning styles and employability skills to identify personal career interests.

Standards Addressed--dependent upon the subject in which the lesson is immersed:

- Priority Learning Standards
  - *English Language Arts (LA) Grades 5-8: Written Expression* -
    - W 2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
  - *Mathematics*
    - 8.G.7 - 1 Apply the Pythagorean Theorem in a simple planar case.
    - 8.C.5.2 Apply geometric reasoning in a coordinate setting, and/or use coordinates to draw geometric conclusions. Content Scope: Knowledge and skills articulated in 8.G.2, 8.G.4.
  - *Middle School Physical Science* (*MSPS* 2)-Motion & Stability: Forces and Interactions
  - *Social Emotional Learning Goal 3* (Illinois Early Learning and Development Standards - IELDS 32)

        - Demonstrate decision-making skills and responsible behaviors in personal, school, and community contexts. Critical Concepts 3A: Consider ethical, safety, and societal factors in making decisions.
    - *Social Emotional Learning Goal 2* (IELDS 31)
        - Use social-awareness and interpersonal skills to establish and maintain positive relationships.
        - 2B: Recognize individual and group similarities and differences.

- Illinois Social/Emotional Standards:
    - Goal 1: Develop self-awareness and self-management skills to achieve school and life success.
        - 1B Recognize personal qualities and external supports--
    - Stage I--1. Identify possible career and volunteer opportunities based on your identified interests and strengths.

- American School Counselor Association (ASCA) Standards
    - Mindset Standards:
        - M 2: Self-confidence in ability to succeed.
        - M 4: Understanding that postsecondary education and life-long learning are necessary for long-term career success.
        - M 6: Positive attitude toward work and learning.
    - Behavior Standards:
        - Self-Management Skills:
            - B-SMS 1: Demonstrate ability to assume responsibility.
            - B-SMS 2: Demonstrate self-discipline and self-control
            - B-SMS 3: Demonstrate ability to work independently.
        - Social Skills:
            - B-SS 9: Demonstrate social maturity and behaviors appropriate to the situation and environment.

- Illinois WorkNet Postsecondary & Career Expectations (PaCE) Student Checklist
    - Identify potential careers you are interested in.
    - Explore career clusters.
    - Research careers you are interested in: what the job responsibilities are for each career, and what kind of education and skills are needed.

- **Illinois Learning Standards**
    - Mathematics-data can be collected from the flight of the rocket, displayed in an appropriate graph, and analyzed.
    - Science- forces and motion, theory of flight, air pressure

Essential Employability Skills. There are four essential employability skills
- Personal Ethic: integrity, respect, perseverance, positive attitude
- Work Ethic: dependability, professionalism
- Teamwork: critical thinking, effective and cooperative work
- Communication: active listening, clear communication

The focus of this lesson is on integrity, positive attitude, critical thinking and active listening.

Skill	How It Is Addressed:
Integrity	Completing the value survey should be done with integrity. Students should not rush through the process or fear getting an answer wrong as that is not possible. Students should be honest and do the best that they can to answer all questions truthfully.
Positive Attitude	This activity is about self-exploration. Adolescents can struggle with their identity and this is a good way to allow them to understand that everyone has a talent and a skill they can be proud of and their personal values are important.
Critical Thinking	Working with a peer is essential at the workplace and in the classroom. Sharing values and ideas while receiving support without judgment results in a positive productivity environment.
Active Listening	The building of the jet aircraft as well as the engage activity focus on good listening skills.

Enduring Understandings:

- Students will know how to apply their network lists, learning styles while building a potential list of career ideas.

Resources and References:

Each rocket requires the following materials:

1. Scissors
2. Glue stick or white glue
3. Colored pencils/markers/pens
4. 2-liter soda bottle, empty and clean
5. Water, about one liter or a bit less
6. Clear packing tape
7. Carboard, foam, plastic and/or paper for design
8. Protractor
9. Rock, washer, or nut
10. 12” piece of string.
11. Bicycle tire pump
12. Rocket launcher.
    There are several commercial rocket launchers available. It is also possible to build a functional launcher, but it will take some time to perfect it. An internet search for “water rocket launcher” or “bottle rocket launcher” will produce a multitude of options. Launchers that utilize a locking mechanism are safer and more reliable but are also a bit more complex to build and more expensive.

Lesson in the classroom will also require:

1. Paper and pen/pencil for each student.
2. Student access to Illinois Career Information System, the career website used in Lessons #2 through #4, as a reminder if you had signed-in as an individual, use the same sign in with this lesson. (Some schools have a group account so you may have access to the login information. Working with your administration or school counselor might be helpful to secure your student's login info.) Many school districts use other career exploration tool/programs such as Xello, Major Clarity, Naviance or Illinois WorkNet. Your school/career counselor will be helpful in matching the goals of this lesson with progress of the school/s career exploration program.

Suggested Differentiation Strategies:

- Using partners or working in small groups.
- Writing notes, paraphrasing, or using pictures are all acceptable.
- Some students may need help cutting, taping, and assembly of the rocket.
- The rocket project allows room for creativity. Some students will be uncomfortable with choice and claim to not know what they are supposed to do. In many cases, exactly what to do is rather flexible and many options will all work out fine. Provide support as necessary but avoid telling them what to do.
- Access to a variety of technology online tools for students to express their thoughts, i.e.: , Jamboard, Google Slides, Google Docs, Google Sheets, PearDeck, oral answers using Vacaroo, etc.
- The only way to not succeed in this activity is to not do it. Instructions can be read out loud for readers who struggle with vocabulary. Some students may need some guidance to stay at the specific section on the website to complete their tasks.

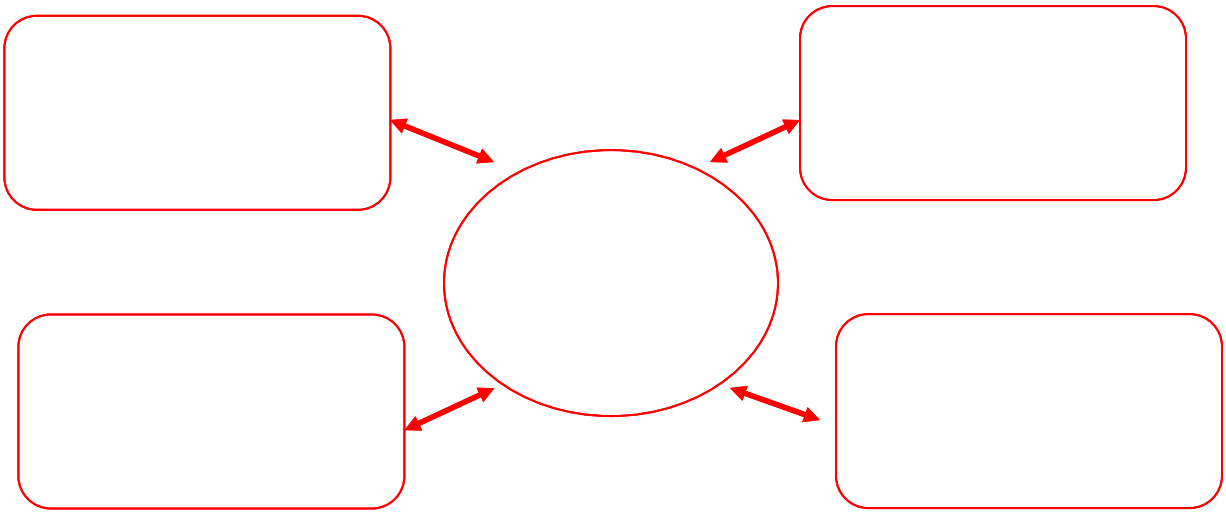
Throughout this lesson, suggested teacher notes and comments are in red.

1. Engage: (15 minutes)

If guidance is needed an example of a diagram or two can be shown. You can use paper/pen, markers, etc., OR students can design their network diagram online using Google Slides, PowerPoint, Jam board, or any other presentation software.

Who is in your network?

1. Draw the following diagram on a large sheet of paper or in the digital format your teacher instructs.



2. Place yourself in the middle of the diagram and connect two, three or four shapes.
3. Give each shape a description such as; family, friends, neighbors, school, and others.
4. Add the names of people who can help you with your journey to your career inside each box.
5. Then go back and identify each person with what type of job or career they have or where they work.

Ask these questions and encourage students to think about their answers as they draw their diagrams.

1. Tell me why these people are in your "network".
2. How can these people help you with making decisions about choosing a career?
3. Tell me about people you see every day on your way to school. Why kinds of jobs or careers do they have…Did you notice anything? Are those people's names in your network diagram?
4. Why do you need people to help you towards your career path? Are there barriers or obstacles to overcome to get to your career?
5. Did you have any of the same choices as another student? Why? What does that tell you about these students? What does it tell you about yourself?
6. Had you ever thought about asking someone to talk about their job? Why is it important to learn about the jobs of people you know?
7. What questions can you ask someone about their job? Is it easier to ask someone about their job if it is a career you are interested in? Why or Why not?
8. Were there any areas in the diagram that were hard to add people? Why?
9. Why do you think we did this activity? What did you learn by doing it?
10. Networking. What does that mean?

Getting to the successful, fulfilling career you want is a path that you cannot do by yourself, you need a crew or network of people. Once you know where you want to go then you want to choose a direct path or plan to land exactly where you want to be.

a. What is the fastest and most direct way to achieve a job in the career area you are interested in?
b. Who do you need to help you get there?

2. Explore: (20 minutes)

It is now time to go extremely fast, very high, and a long, long distance. You need a rocket!
Although each student could build their own rocket, it is beneficial for them to work in teams of 2 or 3 to emphasize the networking component of the lesson.

Space Shuttle Launching

1. Start with an empty and clean 2-liter soda bottle.
   There are slight variations in 2-liter bottles that may require adjustments to the launcher that you use. It is best if all bottles are from the same manufacturer to assure uniformity. It can be time consuming to adjust the launcher for different types.

DO NOT USE WATER BOTTLES. They are not designed to withstand pressure.

2. Your rocket will be filled about 1/3 full of water. It will then sit on the launcher with the neck down. Air will be pumped into it and then released. A poorly designed rocket will go about 25 feet in the air. A very good rocket will go well over 100 feet high. They fly very fast so good construction is necessary.
   Students invariably underestimate the speed of the rocket and the forces exerted on it. It may be helpful to show them a video of a water rocket launch so they have some idea of the quality of construction required for a successful rocket.

3. Water rockets work best if they are about 3 feet long and have small fins on the bottom. Most people, however, don't make them that long. Also, try to keep it light weight.
   Most bottle rockets are only the length of the bottle. It is very difficult to get short rocket stable. Unstable rockets will fly, but not well.

Water Rocket Launch

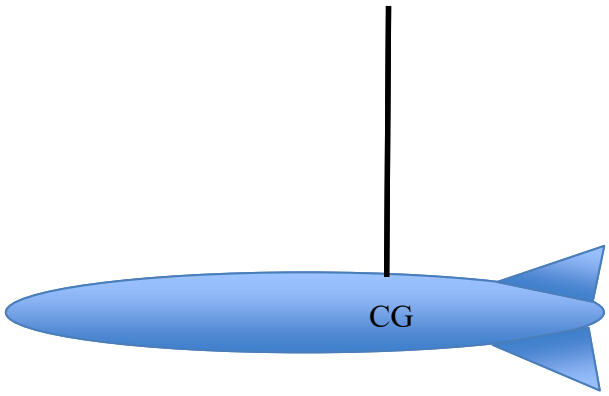
4. Look over the materials the teacher has provided for you. What can you use to make your rocket body longer?
   A variety of construction methods are possible including cutting the bottom out of another bottle and taping it on top of the first, using a paper towel tube or a tube from wrapping paper. Also, a large sheet of paper can be rolled into a tube or cone and taped on top. It can be challenging to get the extension straight and secure.

5. Hold your rocket together with clear packing tape. Hot glue works okay but be careful not to melt or cut any holes in the bottle.
   The rocket will not fly if the bottle is punctured.

6. Mount a few fins near the bottom. They can be made of foam core board, cardboard, or foam or plastic from a disposable plate. Fasten them on securely and be sure they are straight.
   Students usually make the fins too large and place them too close to the center of the bottle. They should be small and placed as far aft as possible, but yet not interfere with the launching mechanism. It is a good idea to have the launcher available during construction. Do not, however, allow test flights. Even a few strokes of the air pump in a dry rocket will propel it through ceiling tiles in the classroom.

Preflight Testing: I

1. If your rocket is not stable, it will not fly straight. It will tumble in the air. Tie a string around the middle of the rocket. Adjust it until the rocket hangs level and tape it so that it does not slide. This spot on your rocket is the Center of Gravity. Label it as CG.
   The string should be at least 6 feet long. Tie it securely and tape it in place, otherwise it will slide.

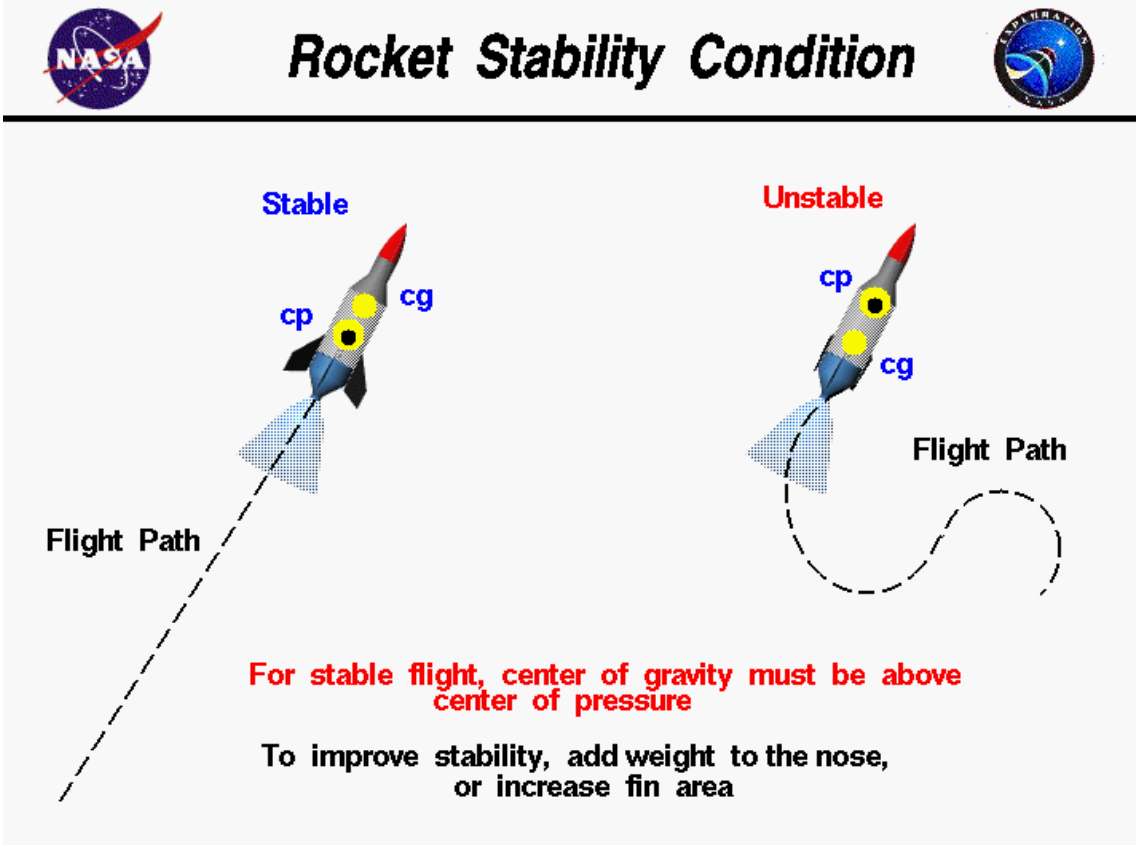


2. Carefully swing the rocket around in a circle. Don't hit anything or anybody!
   This step is best completed in the hallway or outdoors.

3. If your rocket is stable, it will eventually turn in the air and point forward.
   This step is best completed in the hallway or outdoors.

4. If it does not point forward, the Center of Pressure (CP) is too far forward of the CG. To move the CG forward, put a little weight on the top end of the rocket. To move the CP back, move the fins way to the bottom of the rocket and perhaps make them larger. Experiment.
   The Center of Pressure is affected by the size and placement of the fins. The Center of Gravity is based on the distribution (placement) of the weight. A small amount of weight in the nose of the rocket is usually enough. A long rocket will require less weight because

of the leverage. If students struggle with this concept, ask them which end of an arrow gets the arrowhead and which end gets the feathers. Ask what would happen if they fired an arrow from a bow with the feather end first.



Rocket Stability Condition

A very common question when launching rockets is "how high did it go?" Use this opportunity to teach trigonometry. Of course, trig is not a middle school concept, but students can measure angles (4th grade math standard) and multiply by decimals (5th grade standard) so they can "do the math."

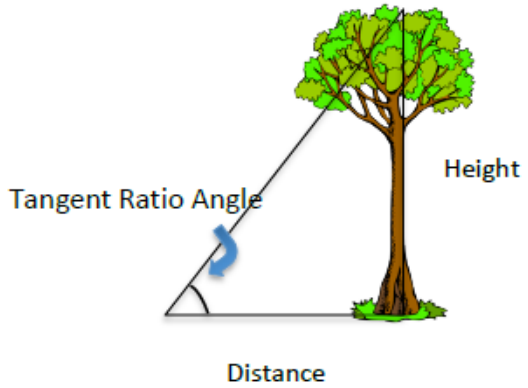
Altitude Calculations:

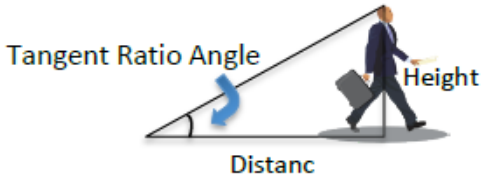
1. Before launch day, build a device to measure the altitude of the rocket.
2. Roll up a piece of paper to make a tube about 1 ½" diameter. Tape it in place.
3. Cut a quarter of a circle from cardstock. It should have a radius of at least 6".
   You can use a protractor, but they are usually fairly small and have lots of confusing numbers on them. If students make their own protractor, they learn more about it and can write only the numbers they need.
4. Use a protractor to put degrees on the cardstock.
   They do not need to write all 90 of the degree measurements on the edge of the protractor. Noting every 10 degrees will be sufficient.

5. Tape the cardstock protractor to the side of the paper tube so that 0 is down and 90 is towards the back.
6. Tie or tape a rock, washer, or nut to the end of a 12" piece of string.
7. Tape the other end of the string to the corner of the protractor so that it hangs down.
8. If the tube is horizonal, the string should be at 0. As the tube is angled up, the string will indicate the angle.
9. Test your instrument by measuring the angle to some tall object. Write down the angle.
10. Measure the distance from where you stood to take the measurement and directly below the object.

$$\text{Tangent Ratio} = \frac{\text{Height of Triangle}}{\text{Distance from Object}}$$

$$\text{Height of Object} = [\ \text{Tangent Ratio} \times \text{Base Distance from Object}\ ]$$





11. Look at the Table of Tangents to find the tangent ratio for the angle you measured.

12. Multiply the tangent ratio by the distance to the object to get the height.

Table of tan(angle)

Angle	tan(a)	Angle	tan(a)	Angle	tan(a)	Angle	tan(a)
0.0	0.00	25.0	.4663	46.0	1.0355	71.0	2.9042
1.0	.0175	26.0	.4877	47.0	1.0724	72.0	3.0777
2.0	.0349	27.0	.5095	48.0	1.1106	73.0	3.2709
3.0	.0524	28.0	.5317	49.0	1.1504	74.0	3.4874
4.0	.0699	29.0	.5543	50.0	1.1918	75.0	3.7321
5.0	.0875	30.0	.5773	51.0	1.2349	76.0	4.0108
6.0	.1051	31.0	.6009	52.0	1.2799	77.0	4.3315
7.0	.1228	32.0	.6249	53.0	1.3270	78.0	4.7046
8.0	.1405	33.0	.6494	54.0	1.3764	79.0	5.1446
9.0	.1584	34.0	.6745	55.0	1.4281	80.0	5.6713
10.0	.1763	35.0	.7002	56.0	1.4826	81.0	6.3138
11.0	.1944	36.0	.7265	57.0	1.5399	82.0	7.1154
12.0	.2126	37.0	.7535	58.0	1.6003	83.0	8.1443
13.0	.2309	38.0	.7813	59.0	1.6643	84.0	9.5144
14.0	.2493	39.0	.8098	60.0	1.7321	85.0	11.430
15.0	.2679	40.0	.8391	61.0	1.8040	86.0	14.301
16.0	.2867	41.0	.8693	62.0	1.8907	87.0	19.081
17.0	.3057	42.0	.9004	63.0	1.9626	88.0	28.636
18.0	.3249	43.0	.9325	64.0	2.0503	89.0	57.290
19.0	.3443	44.0	.9657	65.0	2.1445	90.0	infinite
20.0	.3640	45.0	1.000	66.0	2.2460		
21.0	.3839			67.0	2.3559		
22.0	.4040			68.0	2.4751		
23.0	.4245			69.0	2.6051		
24.0	.4452			70.0	2.7475		

Use your browser "Print" command to make copies of this form.

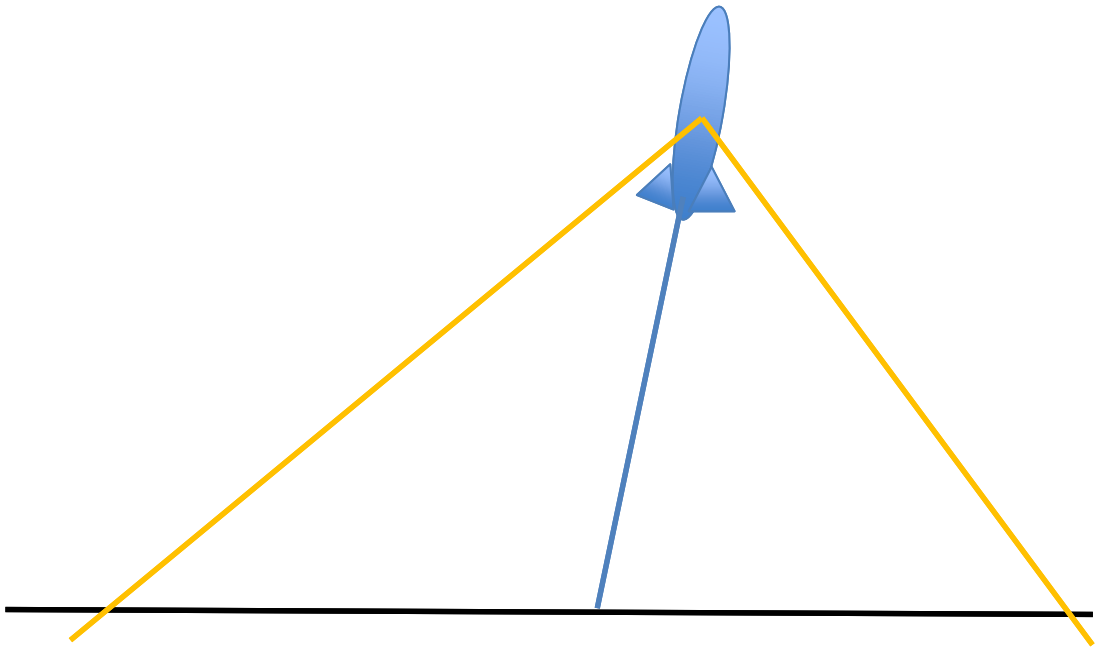
[Table of tan(angles)]

Launch Day:

Launching bottle rockets is a very safe activity, but accidents can happen. Do not allow students near the launch pad. It is common to bend over the rocket to see what is going on and risk a launch directly into an eye. Another risk is that the flying rocket will strike a spectator. Keep everyone at least 30 feet from the launch area. Usually the rocket falls slowly, but occasionally it will come down nose first and stick into the soft ground. It is unlikely to damage a person or property, but it is possible. Only under extreme cases will the rocket bottle burst. They can withstand well over 100 psi which is difficult to achieve with a bicycle tire pump.

A clipboard and blank data table will be necessary for recording flight data. Announce the name and/or number of each launch so data can be recorded properly.

1. Set up the launcher in the middle of a large open area.
2. Measure 50 feet from the launcher for spot to take the angle measurements.
3. Fill the bottle about 1/3rd full of water.
   Allow students to experiment. It will fly without water.
4. Mount the rocket launcher.
5. Pump up the pressure, being careful to not put your head above the rocket in case it goes off too early. It will hurt and maybe destroy your eye!!!
6. When full, countdown to 0 and launch.
7. Track the flight of the rocket and when it reaches its apogee (the highest point) record the angle.
   If the tracking stations are equally spaced around the launch pad and the same distance from it, their data can be used to determine how far and which direction the rocket drifted. If it goes straight up, all tracking stations around the circle will get similar angle measurements. If it drifts west, the tracking stations on the east side will get a lower angle and the ones on the west will get a higher angle. With some guiding questions, students will see this pattern in the data table and will be able to explain the reason for the different measurements.

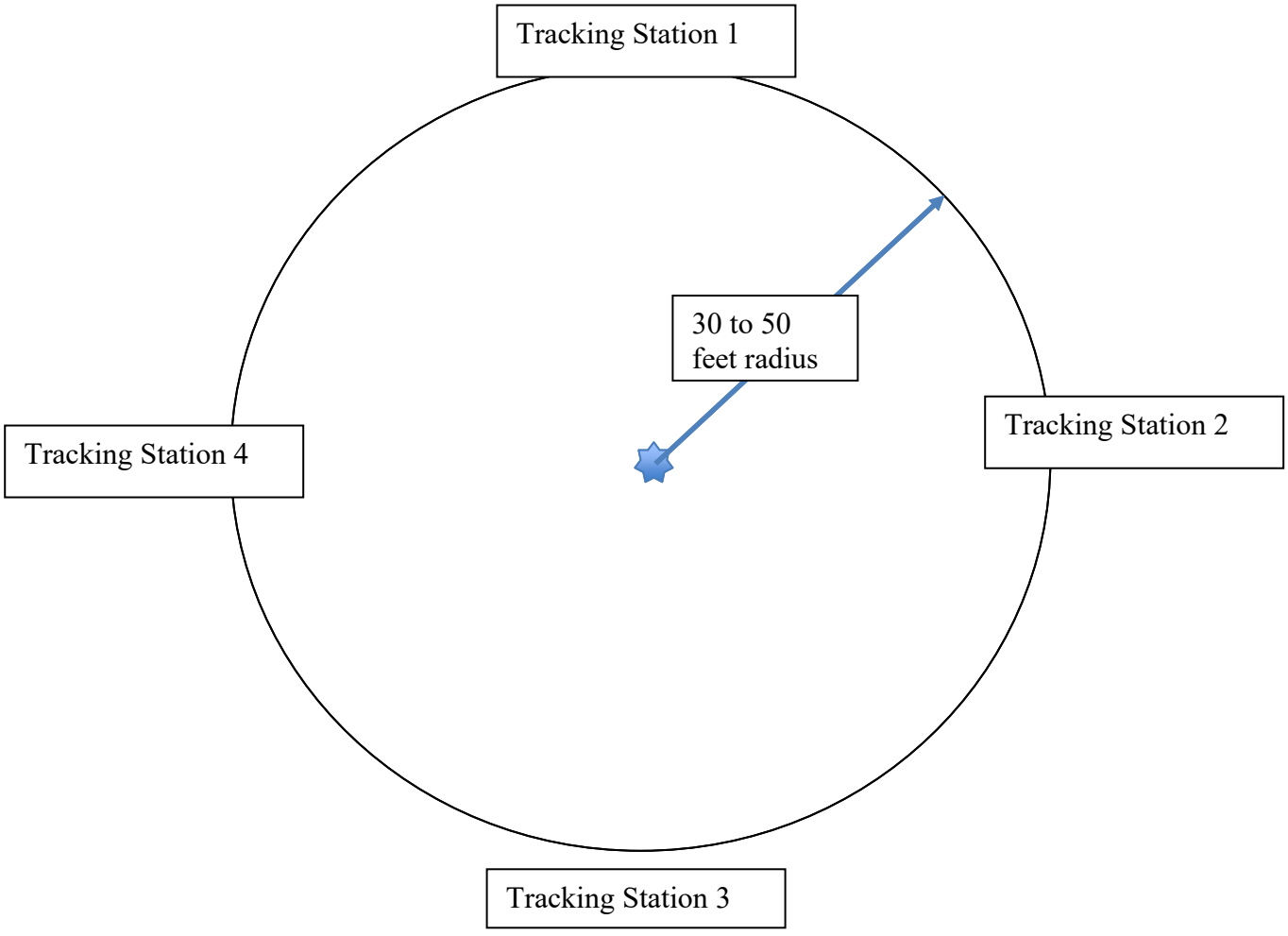


8. Find the tangent ratio for the angle and multiply by 50 to get the altitude.

1. After the launch return to the classroom and place data in a data table similar to the one below:

Rocket	**Tracking Station 1**	**Tracking Station 2**	**Tracking Station 3**	**Tracking Station 4**
1				
2				
3				
4				
5				
6				

Require each team calculate their altitude as measured by each tracking station and record the height on the data table. They should also be able explain discrepancies.



3. Explain: (20 minutes)

Choose the format in which you would like the students to respond to the following questions. Be creative. Use formal or informal response, written or digital responses using Jam board, Google Slides, Google Docs Table, Google Sheets, PearDeck. Oral responses using Vacaroo, etc. Emphasize the importance of their **why** answers.

Questions to answer in the method/format the teacher directs.

1. What does a rocket do that airplanes cannot?
2. Explain the design of your rocket.
3. Was it stable the first time you tried it? What did you have to do to make it stable?
4. Explain how to measure an angle and calculate altitude.
5. What part of this activity did you like the best? Why?
6. What kinds of things did you do with this rocket activity that you think an employer would be looking for in somebody they hired?
7. List several careers that would allow you to do some of the things you liked about this rocket activity. Yes, "rocket scientist" is a real job.

4. Elaborate/Extend:(30 minutes)

If the students have access to their scores from the survey from the last session, they should have seen a chart that looks like a variation of this. Allow them to sign back in or use your (or a generic) account to click around if they need to see a visual of the sign in process again.

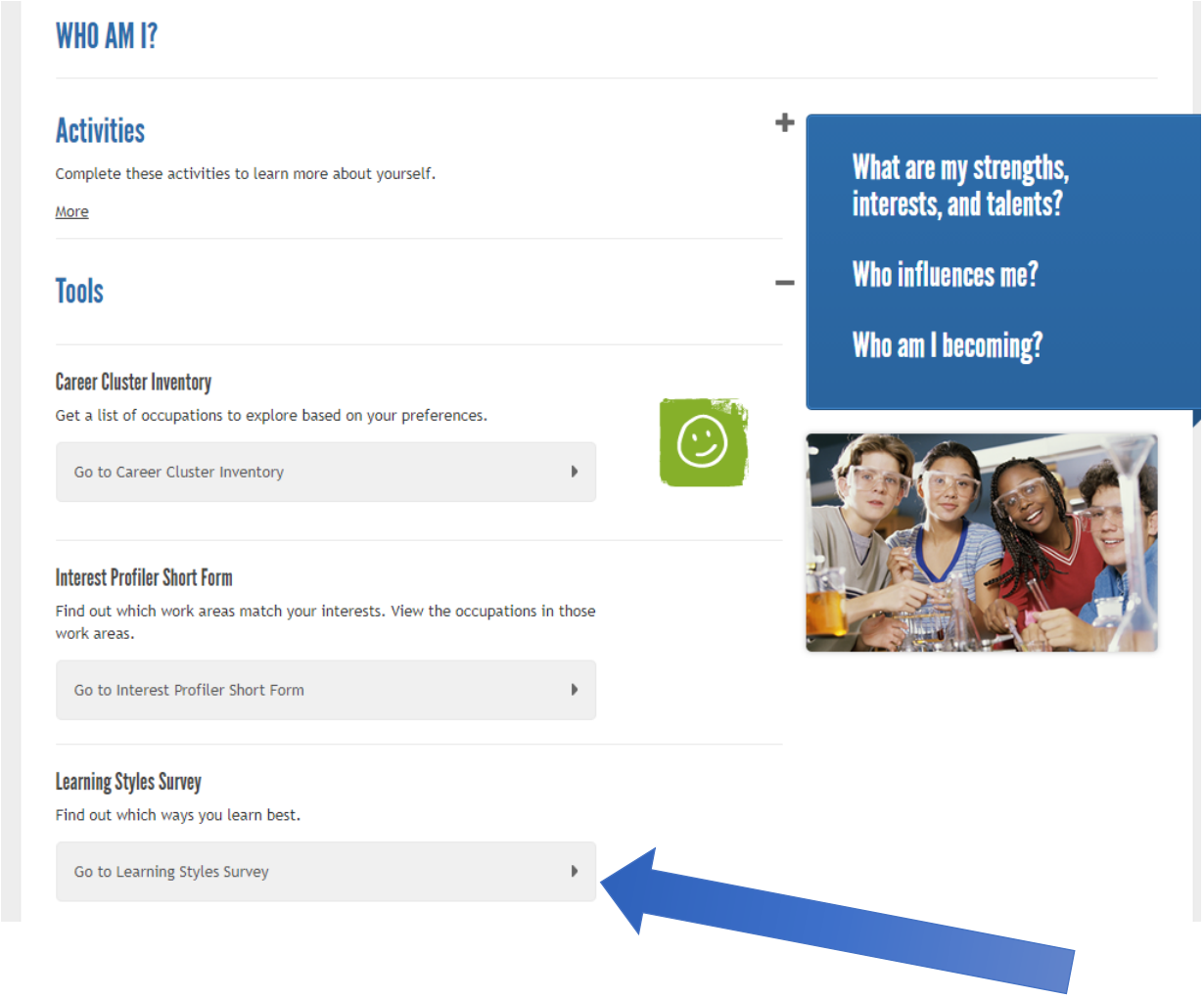
If you are using a different career exploration program/tool (Xello, Major Clarity, Naviance or Illinois WorkNet), have students look at their suggested careers based upon their interests and value survey during this Elaborate section. Instruct students to complete a Learning Styles Survey, look at the Employability Skills and then choose one or two specific careers to learn about concentrating on the path to that career.

1. Sign into your account at: Illinois Career Information System

2. Click on the IL Residents tab in the middle of the screen and select "CIS Junior".

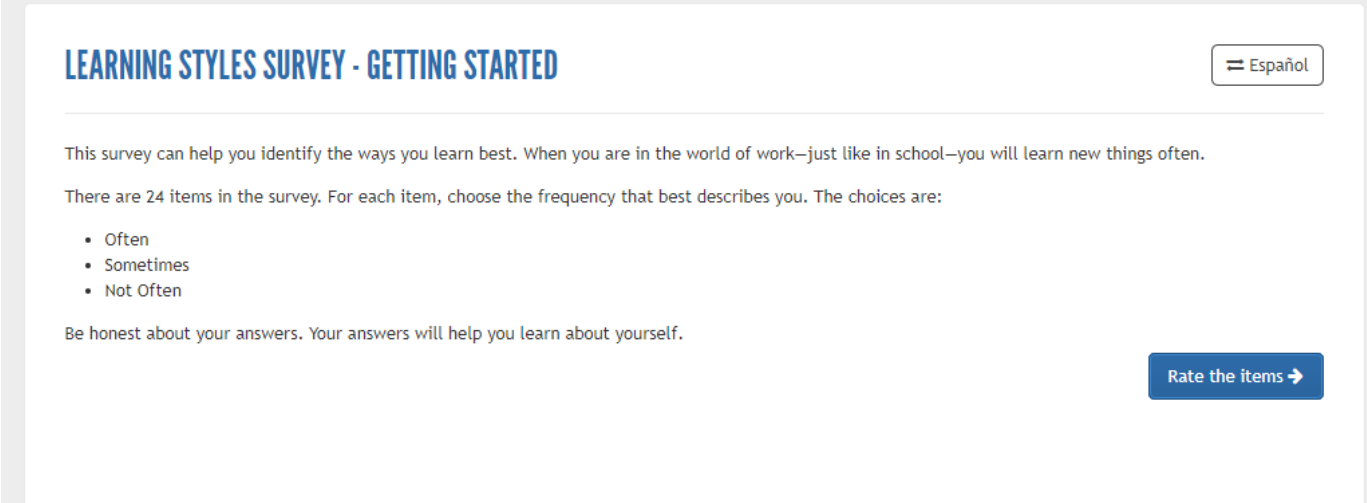
3. Key in your Username and Password.

4. Click on the "Who Am I" tab on the top and then click on the + sign to the right of Tools to see this screen:



5. Click on the box “Learning Styles Inventory.”

6. You should see this screen:

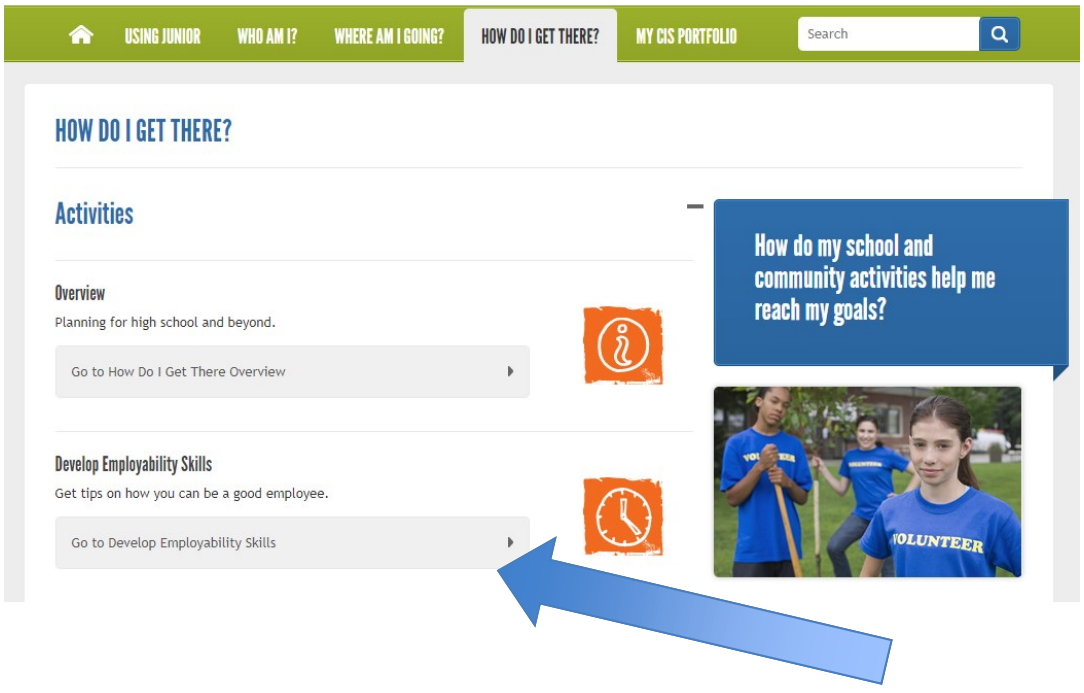


7. Click on your best answer for each question, there will be 24 questions.

8. When you are done, select the Results button at the bottom right and you will get your **Learning Styles Survey** results.

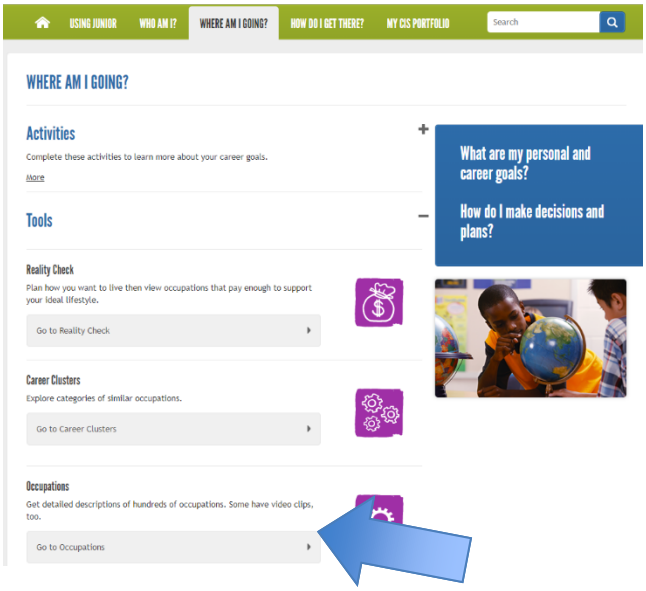
9. Scroll through the three areas (Visual, Tactile, Auditory), read through each description. Click on the "Check Out Learning Style Study Tips" link for information about how you learn best.

10. Now click on **How Do I Get There?** Tab and choose **Develop Employability Skills**.



11. Read through the employability skills on this page. Does this describe you? Are there areas you need to work on to be better? How can your network help you with those skills?

12. Now let us take the time to learn more about a career that you listed in the Explain section of the lesson. Click on the "**WHERE AM I GOING?**" Tab, then point to the word **Tools**, and then select **Occupations**. Choose an occupation that you are interested in and explore each topic in the Overview section: What will the Work Be Like?, Where Would I Work?, What Skills Do I Need?, How Much Would I Earn?, Will There Be Jobs in the Future?, How Do I Prepare?, What Should I Study?



13. Consider what you have just read online about an occupation/career. Make sure this career matches and does not conflict your learning style and employability skills.

14. Take a few minutes to explain your answers to the following questions in the format/method your teacher instructs:
(Teachers look at other ideas below.)

    a. Did you notice anything interesting about this career?
    b. Did you learn anything new?
    c. Are there any conflicts with your learning styles and employability skills within this career?
    d. Are you seeing any connections with making a networking chart, building a rocket and the career you researched?
    e. Nobody flies alone. For you to accomplish your dream job/career, who do you need to help you along the way? Who do you need on your flight "ground crew?"

There are a lot of ways to look at what a career can mean to a student at this point. The most basic idea is that they are seeing a pattern between who they are (what are their values, their interests, what they like to do, skills, learning styles) and how (their personal network, career path) they can seek a career. They can specifically look at "**How Do I Prepare**" and "**What Should I Study**" in this section. Give them time to find out something interesting that they might not have realized before!

Be creative with how you want the students to explain their thoughts at this time. Do you want them to: write their answers?, draw pictures to represent what they learned and/or how they feel about that information?, create a video of themselves explaining their thoughts and what they learned about the specific career?, record a podcast that briefly highlights the career of their choice? or record an advertisement for an opening of a job position within that career? OR a digital roundtable where students can comment on each other's responses. The possibilities are endless!!!

NEXT STEP….For teachers of 7th and 8th graders (You may want to invite your School/Career Counselor and/or a CTE teacher from high school to help with career paths and courses/programs available at their high school. This SCR series of 5 lessons have prepared students to complete their 8th grade course requests or high school course plan using the data from Illinois Career Information System or the career exploration tool/program (Xello, Major Clarity, Naviance or Illinois WorkNet).

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5. Evaluate:

Your teacher may use the following rubric to evaluate your understanding of the information presented in the lesson.

(3) Exceeds Expectations/ Accomplished	(2) Meets Expectations/ Competent	(1) Developing Toward Expectations
The student followed directions and collected data carefully and diligently and completed the rocket project.	The student followed most of the directions with a few minor errors and completed the rocket project.	The student followed a few directions and was unable to completely collect the data and finish the rocket project.
The student helped by encouraging and assisting others while problem solving during construction, while considering other students' suggestions.	The student tried other students' suggestions while problem solving during construction without being a distraction of others.	The student tried but had some difficulty solving problems during construction OR did not take an opportunity to help others and may have been a distraction to others.
The student demonstrated a strong understanding of topic and texts in their responses from the Explain section of the lesson and conveyed ideas and information very clear.	The student demonstrated an understanding of the topic and texts in their responses from the Explain section of the lesson and conveyed clear ideas and information.	The student demonstrated limited understanding of the topic and texts in their responses from the Explain section of the lesson.
The student made a connection between matching their learning styles and employability skills with a career within their responses from the Elaborate section of the lesson.	The connection between matching their learning styles and employability skills with a career within their responses from the Elaborate section of the lesson was prompted after discussion with the instructor.	The student struggled to see the connection or was unable to make the connection between matching their learning styles and employability skills with a career within their responses from the Elaborate section of the lesson.
The student was self-directed and took this lesson seriously, putting forth exceptional effort and a positive attitude.	The student focused on the tasks and needed guidance to be successful.	The student chose not to participate at times and needed to be reminded to return to the task.
Extend Section: Next Step The student independently created an educational plan to a specific career (8th grade classes, high school courses).	Extend Section: Next Step The student created an educational plan to a specific career (8th grade classes, high school courses) and needed more direction.	Extend Section: Next Step The student created an educational plan to a specific career (8th grade classes, high school courses) that was incomplete.

The Extend section:--Next Step in the rubric is there if you complete the Next Step portion of the lesson.

Notes:

All ILCTE lessons are vetted by: Curriculum Leader, Dr. Brad Christensen.
To see a review of this lesson by previous users, please click here.
We invite users of this lesson to click here to leave follow up information and rating.
We would like to publish pictures/videos of your students using this lesson.
Please send to Rod McQuality at: rdmcqua@ilstu.edu.
By sending pictures, you have met all picture/video release for your school.

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M^3: Making My Move

Lesson:
#5 Moving On

Student Edition

Lesson Overview:

This is the fifth in the "M3: Making My Move" lesson series designed to help students in grades 5-8 think about and explore possible careers extending into building a personal network to expand career options. This lesson uses a rocket as the vehicle for instruction and as a visual representation of doing extraordinary things. Students design and build the rocket and then test it for stability before launching. You will also build a tracking device and use it to calculate the apogee (highest altitude). Students compare the tasks completed in this activity to characteristics they feel employers need. you will connect the rocket experience with aspects of career selection and preparation. Finally, students come to realize that just like it requires a crew to launch a rocket, a network of like-minded professionals will help them obtain a successful, fulfilling career.

Learning Objectives: At the conclusion of this lesson and activities, students will be able to:

- Use their abilities, interests, learning styles and employability skills to identify personal career interests.

Essential Employability Skills. There are four essential employability skills

- Personal Ethic: integrity, respect, perseverance, positive attitude
- Work Ethic: dependability, professionalism
- Teamwork: critical thinking, effective and cooperative work
- Communication: active listening, clear communication

The focus of this lesson is on integrity, positive attitude, critical thinking and active listening.

Skill	How It Is Addressed:
Integrity	Completing the value survey should be done with integrity. Students should not rush through the process or fear getting an answer wrong as that is not possible. Students should be honest and do the best that they can to answer all questions truthfully.
Positive Attitude	This activity is about self-exploration. Adolescents can struggle with their identity and this is a good way to allow them to understand that everyone has a talent and a skill they can be proud of and their personal values are important.
Critical Thinking	Working with a peer is essential at the workplace and in the classroom. Sharing values and ideas while receiving support without judgment results in a positive productivity environment.
Active Listening	The building of the jet aircraft as well as the engage activity focus on good listening skills.

Enduring Understandings:

- Students will know how to apply their network lists, learning styles while building a potential list of career ideas.

Resources and References:

Each rocket requires the following materials:

1. Scissors
2. Glue stick or white glue
3. Colored pencils/markers/pens
4. 2-liter soda bottle, empty and clean
5. Water, about one liter or a bit less
6. Clear packing tape
7. Carboard, foam, plastic and/or paper for design
8. Protractor
9. Rock, washer, or nut
10. 12" piece of string.
11. Bicycle tire pump
12. Rocket launcher.

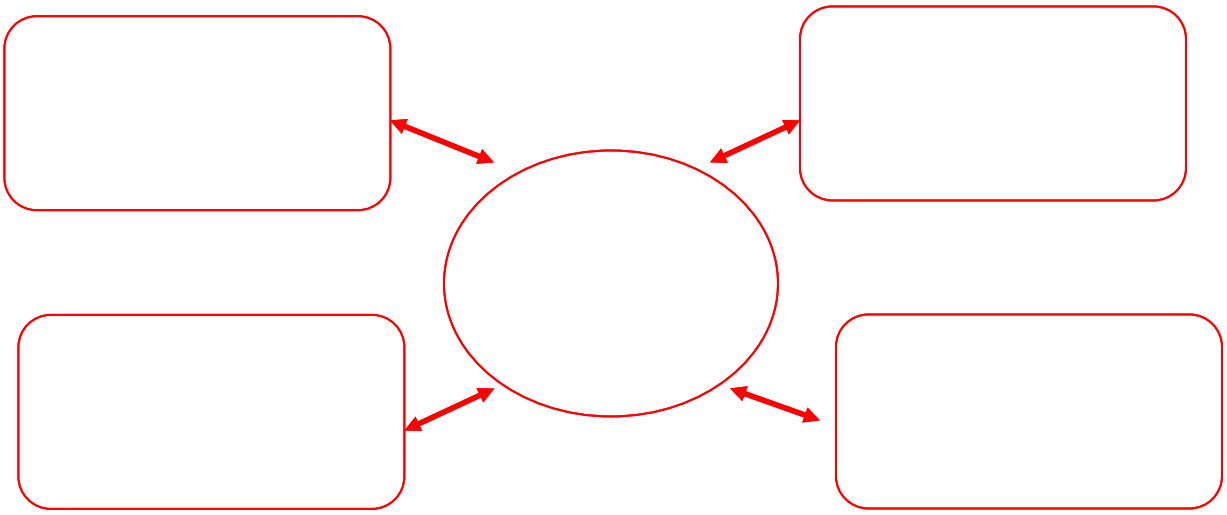
Lesson in the classroom will also require:

1. Paper and pen/pencil for each student.
2. Student access to Illinois Career Information System, the career website used in Lessons #2 through #4, as a reminder if you had signed-in as an individual, use the same sign in with this lesson. Many school districts use other career exploration tool/programs such as Xello, Major Clarity, Naviance or Illinois WorkNet. Your school/career counselor will be helpful in matching the goals of this lesson with progress of the school/s career exploration program.

1. Engage

Who is in your network?

1. Draw the following diagram on a large sheet of paper or in the digital format your teacher instructs.



2. Place yourself in the middle of the diagram and connect two, three or four shapes.
3. Give each shape a description such as; family, friends, neighbors, school, and others.
4. Add the names of people who can help you with your journey to your career inside each box.
5. Then go back and identify each person with what type of job or career they have or where they work.

Getting to the successful, fulfilling career you want is a path that you cannot do by yourself, you need a crew or network of people. Once you know where you want to go then you want to choose a direct path or plan to land exactly where you want to be.

a. What is the fastest and most direct way to achieve a job in the career area you are interested in?
b. Who do you need to help you get there?

It is now time to go extremely fast, very high, and a long, long distance. You need a rocket!

Space Shuttle Launching

1. Start with an empty and clean 2-liter soda bottle.

2. Your rocket will be filled about 1/3 full of water. It will then sit on the launcher with the neck down. Air will be pumped into it and then released. A poorly designed rocket will go about 25 feet in the air. A very good rocket will go well over 100 feet high. They fly very fast so good construction is necessary.
3. Water rockets work best if they are about 3 feet long and have small fins on the bottom. Most people, however, don't make them that long. Also, try to keep it light weight.

Water Rocket Launch

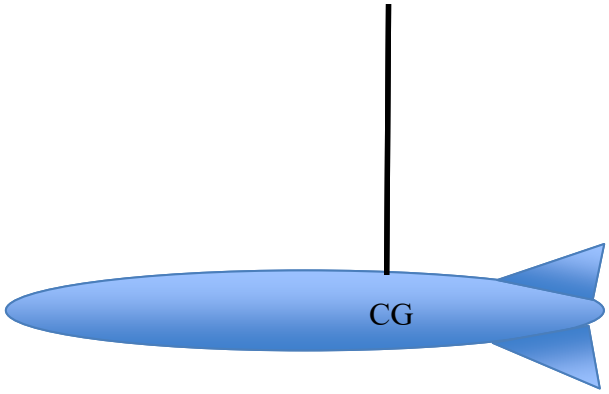
4. Look over the materials the teacher has provided for you. What can you use to make your rocket body longer?

5. Hold your rocket together with clear packing tape. Hot glue works okay but be careful not to melt or cut any holes in the bottle.

6. Mount a few fins near the bottom. They can be made of foam core board, cardboard, or foam or plastic from a disposable plate. Fasten them on securely and be sure they are straight.

Preflight Testing: I

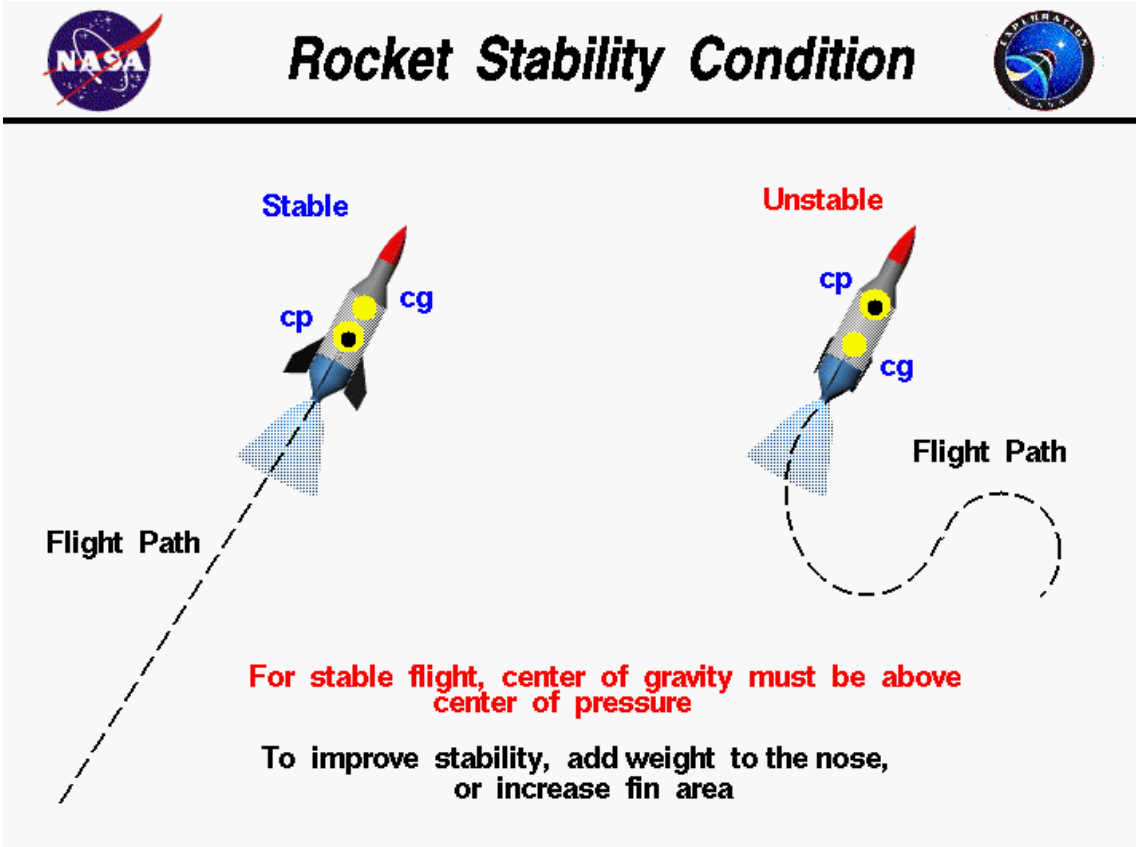
1. If your rocket is not stable, it will not fly straight. It will tumble in the air. Tie a string around the middle of the rocket. Adjust it until the rocket hangs level and tape it so that it does not slide. This spot on your rocket is the Center of Gravity. Label it as CG.



2. Carefully swing the rocket around in a circle. Don't hit anything or anybody!

3. If your rocket is stable, it will eventually turn in the air and point forward.

4. If it does not point forward, the Center of Pressure (CP) is too far forward of the CG. To move the CG forward, put a little weight on the top end of the rocket. To move the CP back, move the fins way to the bottom of the rocket and perhaps make them larger. Experiment.



Rocket Stability Condition

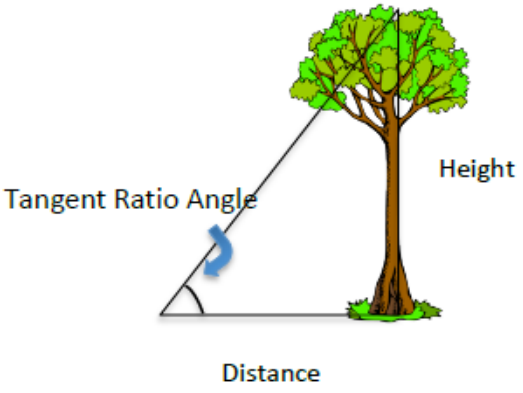
Altitude Calculations:

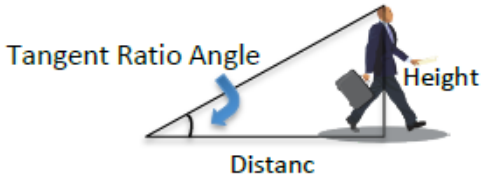
1. Before launch day, build a device to measure the altitude of the rocket.
2. Roll up a piece of paper to make a tube about 1 ½" diameter. Tape it in place.
3. Cut a quarter of a circle from cardstock. It should have a radius of at least 6".|
4. Use a protractor to put degrees on the cardstock.

5. Tape the cardstock protractor to the side of the paper tube so that 0 is down and 90 is towards the back.
6. Tie or tape a rock, washer, or nut to the end of a 12" piece of string.
7. Tape the other end of the string to the corner of the protractor so that it hangs down.
8. If the tube is horizonal, the string should be at 0. As the tube is angled up, the string will indicate the angle.
9. Test your instrument by measuring the angle to some tall object. Write down the angle.
10. Measure the distance from where you stood to take the measurement and directly below the object.

$$\text{Tangent Ratio} = \frac{\text{Height of Triangle}}{\text{Distance from Object}}$$

$$\text{Height of Object} = [\ \text{Tangent Ratio} \times \text{Base Distance from Object}\ ]$$





11. Look at the Table of Tangents to find the tangent ratio for the angle you measured.
12. Multiply the tangent ratio by the distance to the object to get the height.

Table of tan(angle)

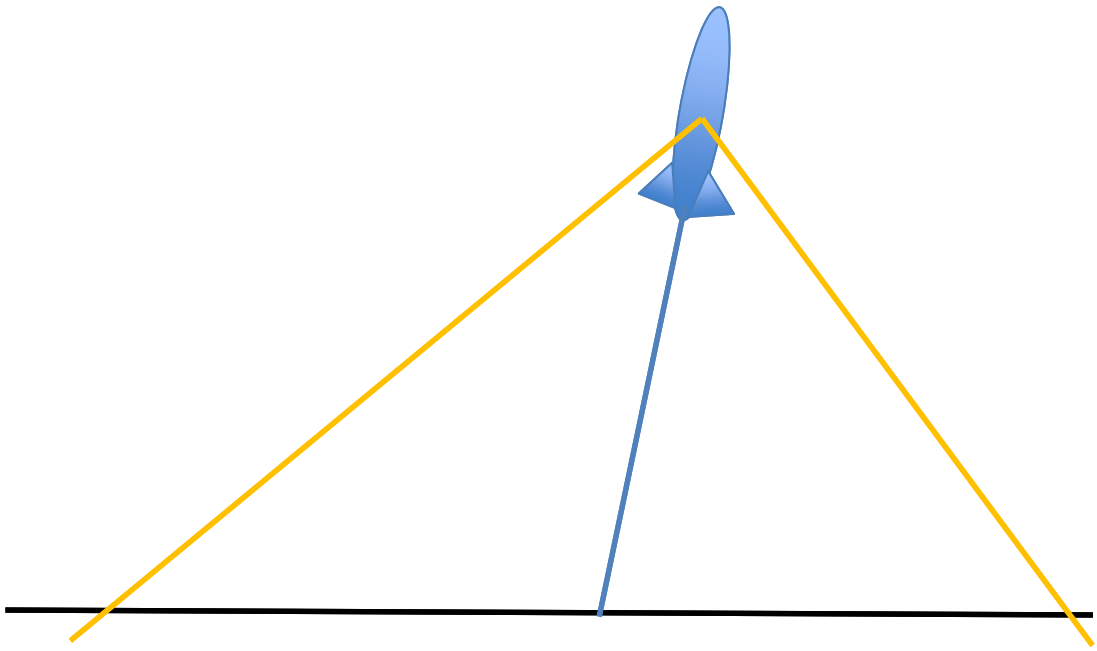
Angle	tan(a)	Angle	tan(a)	Angle	tan(a)	Angle	tan(a)
0.0	0.00	25.0	.4663	46.0	1.0355	71.0	2.9042
1.0	.0175	26.0	.4877	47.0	1.0724	72.0	3.0777
2.0	.0349	27.0	.5095	48.0	1.1106	73.0	3.2709
3.0	.0524	28.0	.5317	49.0	1.1504	74.0	3.4874
4.0	.0699	29.0	.5543	50.0	1.1918	75.0	3.7321
5.0	.0875	30.0	.5773	51.0	1.2349	76.0	4.0108
6.0	.1051	31.0	.6009	52.0	1.2799	77.0	4.3315
7.0	.1228	32.0	.6249	53.0	1.3270	78.0	4.7046
8.0	.1405	33.0	.6494	54.0	1.3764	79.0	5.1446
9.0	.1584	34.0	.6745	55.0	1.4281	80.0	5.6713
10.0	.1763	35.0	.7002	56.0	1.4826	81.0	6.3138
11.0	.1944	36.0	.7265	57.0	1.5399	82.0	7.1154
12.0	.2126	37.0	.7535	58.0	1.6003	83.0	8.1443
13.0	.2309	38.0	.7813	59.0	1.6643	84.0	9.5144
14.0	.2493	39.0	.8098	60.0	1.7321	85.0	11.430
15.0	.2679	40.0	.8391	61.0	1.8040	86.0	14.301
16.0	.2867	41.0	.8693	62.0	1.8907	87.0	19.081
17.0	.3057	42.0	.9004	63.0	1.9626	88.0	28.636
18.0	.3249	43.0	.9325	64.0	2.0503	89.0	57.290
19.0	.3443	44.0	.9657	65.0	2.1445	90.0	infinite
20.0	.3640	45.0	1.000	66.0	2.2460		
21.0	.3839			67.0	2.3559		
22.0	.4040			68.0	2.4751		
23.0	.4245			69.0	2.6051		
24.0	.4452			70.0	2.7475		

Use your browser "Print" command to make copies of this form.

Table of tan(angles)

Launch Day:

1. Set up the launcher in the middle of a large open area.
2. Measure 50 feet from the launcher for spot to take the angle measurements.
3. Fill the bottle about 1/3rd full of water..
4. Mount the rocket launcher.
5. Pump up the pressure, being careful to not put your head above the rocket in case it goes off too early. It will hurt and maybe destroy your eye!!!
6. When full, countdown to 0 and launch.
7. Track the flight of the rocket and when it reaches its apogee (the highest point) record the angle.



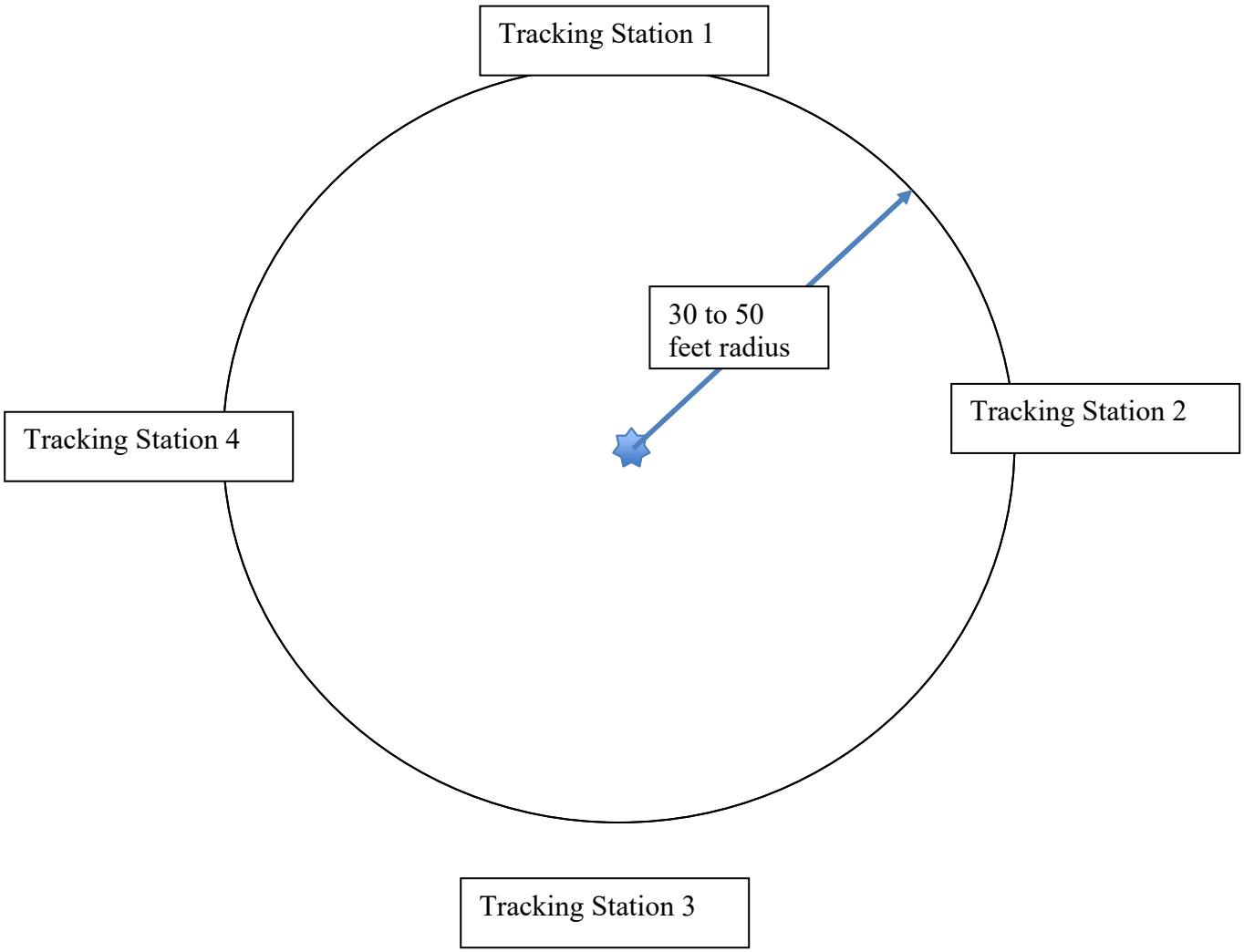
8. Find the tangent ratio for the angle and multiply by 50 to get the altitude.

Launch Bottle

9. After the launch return to the classroom and place data in a data table similar to the one below:

Rocket	**Tracking Station 1**	**Tracking Station 2**	**Tracking Station 3**	**Tracking Station 4**
1				
2				
3				
4				
5				
6				

.



3. Explain

Questions to answer in the method/format the teacher directs.

1. What does a rocket do that airplanes cannot?
2. Explain the design of your rocket.
3. Was it stable the first time you tried it? What did you have to do to make it stable?
4. Explain how to measure an angle and calculate altitude.
5. What part of this activity did you like the best? Why?
6. What kinds of things did you do with this rocket activity that you think an employer would be looking for in somebody they hired?
7. List several careers that would allow you to do some of the things you liked about this rocket activity. Yes, "rocket scientist" is a real job.

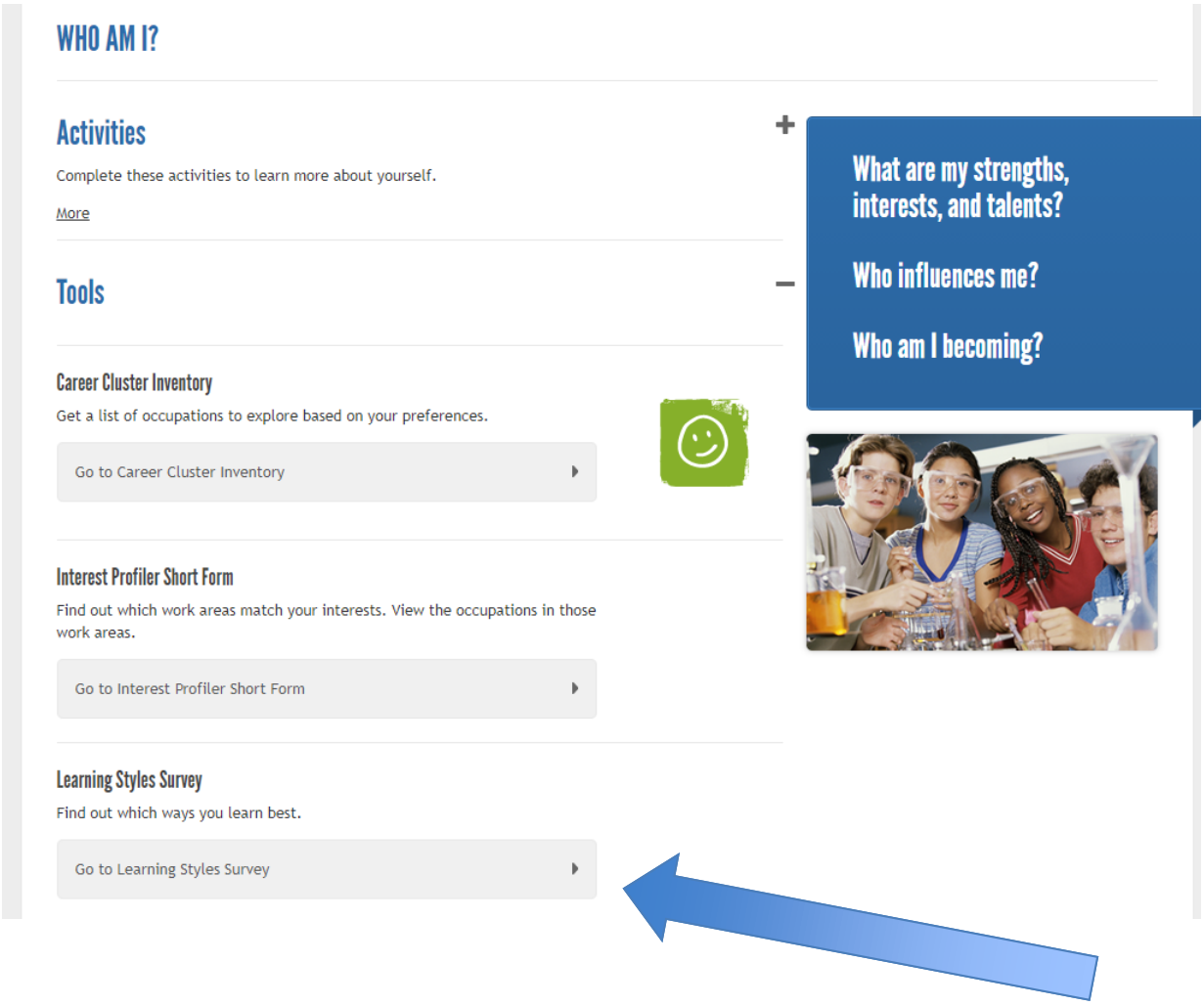
4. Elaborate/Extend

1. Sign into your account at: [Illinois Career Information System]

2. Click on the IL Residents tab in the middle of the screen and select "CIS Junior".

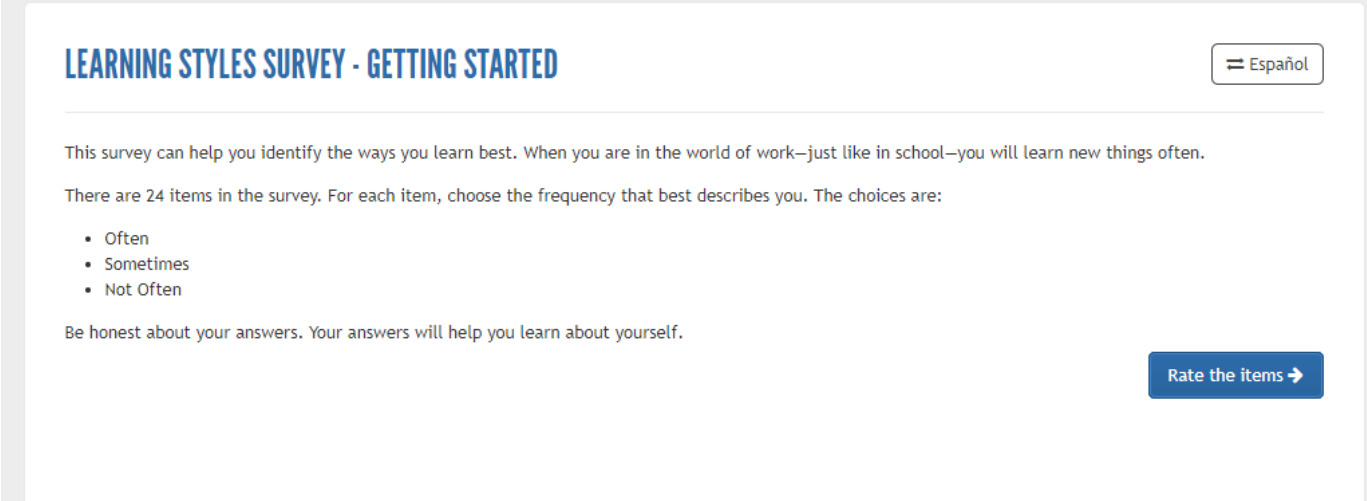
3. Key in your Username and Password.

4. Click on the "Who Am I" tab on the top and then click on the + sign to the right of Tools to see this screen:



5. Click on the box “Learning Styles Inventory.”

6. You should see this screen:

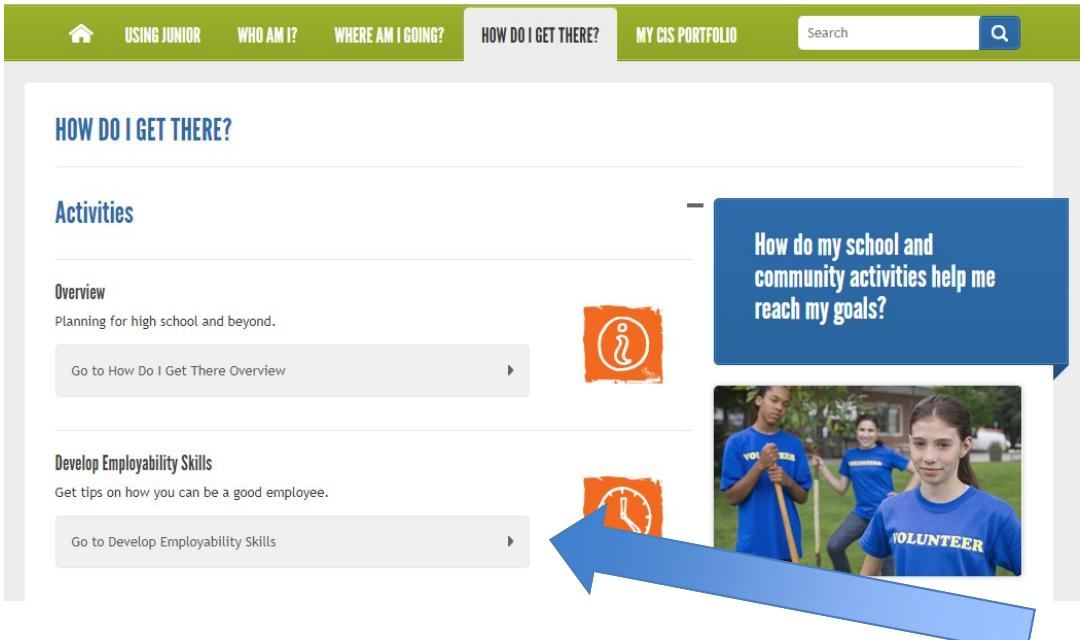


7. Click on your best answer for each question, there will be 24 questions.

8. When you are done, select the Results button at the bottom right and you will get your **Learning Styles Survey** results.

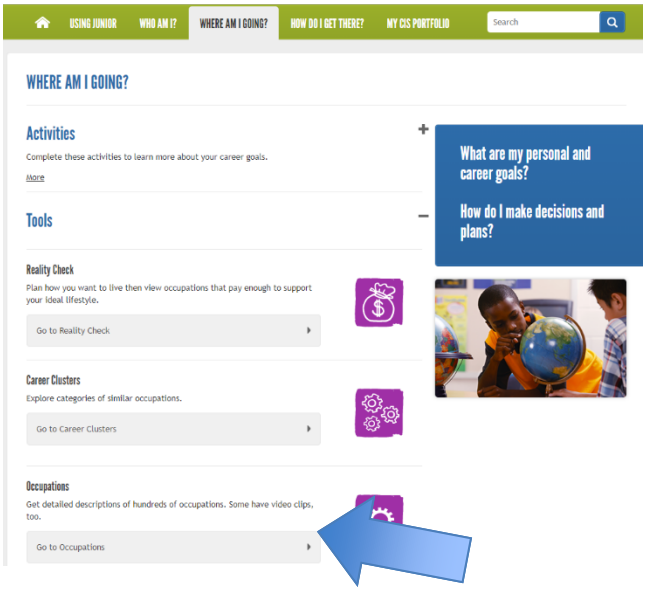
9. Scroll through the three areas (Visual, Tactile, Auditory), read through each description. Click on the “Check Out Learning Style Study Tips” link for information about how you learn best.

10. Now click on **How Do I Get There?** Tab and choose **Develop Employability Skills**.



11. Read through the employability skills on this page. Does this describe you? Are there areas you need to work on to be better? How can your network help you with those skills?

12. Now let us take the time to learn more about a career that you listed in the Explain section of the lesson. Click on the "**WHERE AM I GOING?"** Tab, then point to the word **Tools**, and then select **Occupations**. Choose an occupation that you are interested in and explore each topic in the Overview section: What will the Work Be Like?, Where Would I Work?, What Skills Do I Need?, How Much Would I Earn?, Will There Be Jobs in the Future?, How Do I Prepare?, What Should I Study?



13. Consider what you have just read online about an occupation/career. Make sure this career matches and does not conflict your learning style and employability skills.

14. Take a few minutes to explain your answers to the following questions in the format/method your teacher instructs:

    a. Did you notice anything interesting about this career?
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