



# IGNITE MY FUTURE

## LESSON TITLE

# Career-o-Matic

*Guiding Question: What Does Happiness Mean?*

## Ignite Curiosity

### SUBJECTS

Math  
Computer Science  
Career Development  
Social and Emotional Learning

### COMPUTATIONAL THINKING PRACTICE

Recognizing and Defining  
Computational Problems

### COMPUTATIONAL THINKING STRATEGIES

Analyze Data  
Develop Algorithms

### MATERIALS

Writing materials

Scrap paper

Dice (set of two)

[Career Search](#)

[Student Capture Sheet](#)

[Career-o-Matic Algorithm  
Development Worksheet](#)

- How much does a person's career choice impact his or her happiness in life, and why?
- Why are people interested in different jobs?
- What are the jobs of the future and how can we prepare for them?
- Are there jobs you've heard about recently that you never knew existed? How can we teach students and workers about these jobs?

In this lesson, students will act as data scientists who have been tasked with creating the Career-o-Matic, a new instrument that identifies the perfect career for a student based on various inputs. In **THINK**, students consider the role that probability plays in identifying a satisfying career by playing an interactive game. They also explore career search resources, analyze the strengths and weaknesses of those resources, and record them in a capture sheet. In **SOLVE**, students will use the computational thinking strategy of analyzing data to identify the elements involved in selecting and pursuing a fulfilling job and design an appropriate method for measuring those elements. In **CREATE** students design an application that incorporates those measurements into an algorithm that helps students identify appropriate careers for themselves. In **CONNECT**, students consider how such an application would help improve the lives of individuals and learn about careers that might relate to such a project.

Students will be able to:

- **Analyze** the factors involved in identifying a fulfilling and satisfying career,
- **Apply** that analysis to a career aptitude measurement tool and
- **Create** an algorithm that returns a rating of predicted career satisfaction



Students simulate the role of data scientists who have been challenged to create an instrument called the Career-o-Matic. This assessment tool will match a user with a series of fulfilling vocations.

**1 Read** the following scenario to students:

*Imagine that you are data scientists working for one of the world's largest companies. The company's leadership has seen an alarming problem develop in recent years: job applications from recent college graduates have dropped off significantly. The leadership isn't sure why this is happening but they suspect that it's because the jobs that the company is hiring for aren't listed in common career aptitude tests. The company has hired you and your team to create a new career aptitude test called the Career-O-Matic. This assessment will match a user with a career that is ideal for them based on a series of inputs. Can you think like a computer to design a career aptitude test for the 21st century? Let's find out!*

**2 Present** the following questions to the class for consideration:

- The leading industries of the future are healthcare, education and computer science. How do I know which will have the best job prospects when I'm ready to graduate?
- If I could make more money by starting my own business, should I quit my job?
- Is it more profitable to go to graduate school or enter the workforce right after college?

**3 Ask** students to provide answers to the questions. Explain that we must all make a series of choices as we go through life. These choices could be as small as what to eat for breakfast or as large as what career path to pursue. In order to make the best choice possible, we rely on probability. Probability is the likelihood of something happening.

**4 Demonstrate** the concept of probability by engaging students in an interactive game called THINK. The object of the game is to accumulate the greatest number of points possible.

- Begin by drawing a T-chart on the board that separates the letter T, H, I, N and K. Have students follow along by drawing the same chart on a piece of paper.
- Ask students to stand up. Roll the dice and record the number total in the column under "T" (ex: if you roll a 4 and a 2, you'll record the number 6 under the "T"). The number on the dice applies to all of the students, so each student will write the number 6 on their sheet under the "T" column.
- Explain that for each roll of the dice, the students gain points. There are just two exceptions: if a one is rolled, then the student will lose all points in the current column they are playing in. If two ones are rolled, then all points are wiped out. If a student chooses to sit, they "freeze" their points and protect them from getting wiped out if a 1 is rolled. However, they can't collect any more points moving forward.
- Before your next roll, ask students to decide if they want to sit or stand.
- Roll the dice and record the total on the board.
- Continue in this column until you roll a one. Once a one is rolled, the points are removed and you move to the next column.
- Repeat this until you have moved through the "K" column.



**5 Play** the game two or three times. Students will begin to develop strategies to improve their personal score.

**6 Ask** students the following critical thinking questions:

- Did you improve with each round of the game? Why or why not?
- THINK involved both chance and choice? Where did chance come in? Where did choice come in?
- Can you think of different ways to play the game of THINK?  
Did some of your classmates play it safer than others?
- How could you determine the average amount of points scored before a 1 comes up?  
Why is this important?

**7 Explain** to students that their task in this lesson is the development of the Career-o-Matic, an instrument designed to guide students in their choice of a satisfying and appropriate career. Just as in the game THINK, students will use both chance and choice to determine a career path for an end user. Ask students why the concept of probability is important when considering which career to pursue.



**In small groups, students create a list of key factors that contribute to career satisfaction, determine a method for measuring each of those factors, and identify ways to incorporate technology.**

**1 Distribute** the Career Search student capture sheet. Direct students to compare the following sites and their respective approaches to providing career guidance.

- [The Federal Student Aid page of the U.S. Department of Education](#)
- [The Bureau of Labor Statistics Career Exploration Module](#)

Explain to the students that they are to evaluate the strengths and weaknesses of both sites for two aspects:

- **Content:** What information is provided? How effective is the career advice and guidance that is provided? How does the site provide advice and guidance?
- **Technical:** How effective is the platform used to provide career guidance? Is the information clear and accessible? Is it easy to understand? How easy is it to navigate through the platform?

**2 After** students complete their analysis of the career resources, lead them in a discussion of how they could use these resources in the development of the Career-o-Matic:

- What aspects of career aptitude are determined by chance? Which are determined by choice?
- What are the strengths and weaknesses of the resources?
- How much do the resources focus on fulfillment and satisfaction in career choice? If needed, how could this be improved?
- How personalized and individualized are the information and the guidance provided by these career resources?
- To what extent is the full capability of technology utilized in these resources?
- What changes or additions would make these resources more useful?

**3 Divide** students into small groups, and distribute the [Career-o-Matic Algorithm Development](#) student capture sheet to each group.

**4 Instruct** groups to create a list of four to six key factors that contribute to career satisfaction. Two of these factors should be education and income.

**5 After groups have developed their lists** of key factors, let them discuss and develop a plan for how to measure each factor.

- Explain that all measurements should be made on a scale of 0 to 100.
- Explain that measurements should represent a rating of a particular career for that category. The system should be able to be used for any career.
- Point out that some factors can be measured based solely on the objective traits of the career itself, while other factors will require information both about the career and from the individual student before a measurement can be provided. For example, a category such as “personal fulfillment” depends on the user taking the assessment.
- A baseline level of 0 in an income scale should represent an annual income that is below average for basic living expenses for an average family.

 Find more easy-to-implement resources to integrate computational thinking practices into your classroom by visiting [ignitemyfutureinschool.org](http://ignitemyfutureinschool.org)



**6 Check for understanding** by asking students the following critical thinking questions:

- What elements of the assessment are objective, meaning they apply no matter who is taking the test? What elements are subjective, meaning that their meaning changes depending on who is taking the test?
- How can you design an assessment with both objective and subjective components?
- Should all of your factors have the same weight or should some matter more than others? Why?



## Students develop an algorithm that matches a user with a career that is ideal for them.

- 1 Instruct** groups to develop a plan for customizing the weighting of the career satisfaction factors for individuals. They should write a description of their plan on the [Career-o-Matic Algorithm Development](#) student capture sheet.

Ask students a few questions to spur on their thoughts:

- Should individuals simply be asked to list their own priorities among the factors?
- Will individuals always know their own priorities, or should help be provided in discovering those priorities? If help should be provided, how can this be done?
- Does everyone always have the same strength of feeling about their prioritization? Should this be taken into account?

- 2 Have each group write down** a weight for each of their six factors, ensuring that the weights add up to 100 percent.

- 3 Have each group develop** a list of 20 careers using the [Occupational Outlook Handbook](#) produced by the Bureau of Labor Statistics. This “career bank” will be the dataset for their assessment and should be diverse.

- 4 Provide** students with time to develop a flowchart algorithm that sorts the careers into groups based on the six points of criteria each group has created.

- 5 Then,** students should further sort each group using subjective criteria.

- 6 Once each group has completed their algorithm,** lead the class in a brainstorming session about how to turn these algorithms into assessments that can identify career matches:
  - How would you frame a question to determine how much education a person wants to pursue?
  - How would you determine how important money is to someone?
  - Does your algorithm let the user tell you about their skills and interests? If not, how could you incorporate that into an assessment?



## How can computational thinking help individuals find more satisfying and fulfilling careers and thus improve their lives?

Select one of the strategies listed below to help students answer these questions:

- **How do this problem and solution connect to me?**
- **How do this problem and solution connect to real-world careers?**
- **How do this problem and solution connect to our world?**

- 1 Write** the three questions on PPT or flip chart slides, and invite students to share out responses.
- 2 Display** chart paper around the room, each with one question written on it. Ask students to write down their ideas on each sheet.
- 3 Assign** one of the questions to three different student groups to brainstorm or research and then share out responses.
- 4 Invite** students to write down responses to each question on a sticky note, and collect them to create an affinity diagram of ideas.

### How does this connect to students?

Choosing a career path is one of the most significant and impactful choices that any student will make. Individually tailored career guidance can give students valuable insight into which careers would be an ideal match for them, thereby saving the student valuable time and money in pursuit of a satisfying job. In this activity, students will learn how to use the computational thinking strategies of analyzing data and developing algorithms to update career aptitude tests for the 21st century.

### How does this connect to careers?

**Career counselors** assist people with the process of making career decisions by helping them develop skills or choose a career or educational program.

**Human resources specialists** recruit, screen, interview, and place workers. They often handle other human resources work, such as those related to employee relations, compensation and benefits, and training.

**Social workers** help people solve and cope with problems in their everyday lives. One group of social workers—clinical social workers—also diagnose and treat mental, behavioral, and emotional issues.

**High School Teachers** help prepare students for life after graduation. They teach academic lessons and various skills that students will need to attend college and to enter the job market.

### How does this connect to our world?

If students find a fulfilling career path early, could they make more of a difference or accomplish more in their chosen field? With so many new careers available today, it's hard to know what skills to learn and what will be in demand in the future. By understanding the concept of probability, students can account for the roles of chance and choice in their professional lives.

## National Standards

### COMMON CORE STATE STANDARDS: MATH

#### Investigate chance processes and develop, use, and evaluate probability models.

##### **CCSS.MATH.CONTENT.7.SP.C.5**

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around  $1/2$  indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

##### **CCSS.MATH.CONTENT.7.SP.C.6**

Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.

##### **CCSS.MATH.CONTENT.7.SP.C.7**

Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

##### **CCSS.MATH.CONTENT.7.SP.C.7.A**

Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.

##### **CCSS.MATH.CONTENT.7.SP.C.7.B**

Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

##### **CCSS.MATH.CONTENT.7.SP.C.8**

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

##### **CCSS.MATH.CONTENT.7.SP.C.8.A**

Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

##### **CCSS.MATH.CONTENT.7.SP.C.8.B**

Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

##### **CCSS.MATH.CONTENT.7.SP.C.8.C**

Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?

## National Standards

### Learning Standards for Career Development and Occupational Studies at Three Levels

**Standard 1:** Career Development: Students will be knowledgeable about the world of work, explore career options, and relate personal skills, aptitudes, and abilities to future career decisions.

### Academic Standards for Career Education and Work, Pennsylvania Department of Education

**13.1.8-A** Pennsylvania’s public schools shall teach, challenge and support every student to realize his maximum potential and to acquire the knowledge and skills needed to relate careers to individual interests, abilities, and aptitudes.

#### K-12 COMPUTER SCIENCE FRAMEWORK

### Practice 3. Recognizing and Defining Computational Problems

Collaborative computing is the process of performing a computational task by working in pairs and on teams. Because it involves asking for the contributions and feedback of others, effective collaboration can lead to better outcomes than working independently. Collaboration requires individuals to navigate and incorporate diverse perspectives, conflicting ideas, disparate skills, and distinct personalities. Students should use collaborative tools to effectively work together and to create complex artifacts.

### Core Social and Emotional Learning Competencies

#### Responsible Decision-Making

The ability to make constructive choices about personal behavior and social interactions based on ethical standards, safety concerns, and social norms. The realistic evaluation of consequences of various actions, and a consideration of the well-being of oneself and others.

- Identifying problems
- Analyzing situations
- Solving problems
- Evaluating
- Reflecting
- Ethical responsibility

## Career Search Resources Capture Sheet

	Content Evaluation	Technical Evaluation
Department of Education		
Bureau of Labor Statistics		

# Career-o-Matic Algorithm Development Worksheet

## Description of Plan for Customizing the Weighting of Each Factor

### Key Factors in Career Satisfaction *ex: Income*

### Technologies to Incorporate

### Plan for Measuring Each Factor

## Career-o-Matic Algorithm Development Worksheet Cont.

Factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Rating	<input type="text"/>				
X	X	X	X	X	X
Weighting	<input type="text"/>				
=	=	=	=	=	=
Personalized Factor Score	<input type="text"/>				
	Score 1	Score 2	Score 3	Score 4	Score 5

Sum of Individual Scores = Career Score