Solution Fluency
Teacher's Companion

Skills Perspective
Fluency Snapshot
Project-Based Learning Scenarios
Fluency Assessment Framework

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About the Book

These guides are designed to help you gain a better understanding of the Essential Fluencies and how they work. They'll aid you in your quest to discover how you can utilize, communicate, and facilitate the Fluencies within your classroom environments, and all within the context of the required curriculum.

We hope these companion handbooks will help you in developing the Fluencies as you work to infuse them into your students' learning experiences.

Table of Contents

What is Solution Fluency?

What is the definition of Solution Fluency? What are the specific skills it develops? Why are they important? The answers are in this first chapter. We'll introduce you to the basics of this fluency and why it's crucial as a part of modern learning.

In these beginning pages you'll discover the fundamental meaning of Solution Fluency. We'll then take a look at the 6Ds process, which is an explanation of the working phases. After that, we'll take an in-depth look at the skills each phase develops using the Skills Perspective.

As we go through each phase and its skills, you'll learn why having that skill is necessary today. The meanings embedded in each skill become the foundation for the importance of instilling fluency skills in our students.

solution fluency

Solution Fluency is the ability to think creatively to solve problems in real time by clearly defining the problem, designing an appropriate solution, delivering the solution and then evaluating the process and the outcome. Solution Fluency is defined by the 6Ds process.

Define

In order to solve a problem, we have to clearly define what the problem is first. We must decide exactly what needs to be solved, and give proper context to the problem.

Discover

This is the stage of researching and gathering, and analyzing clear knowledge about the problem. This helps us to give the problem context so that we can identify with it easier.

Dream

Here, we open up the heart and mind to the possibilities and visions of a solution the way we wish to see it. This phase is all about imagination, extrapolation, and visualization.

Design

This is basically the workshopping phase. Here the actual mechanics of your solution begin to take shape. It involves techniques that allow us to get the solution “on paper.”

Deliver

In this phase, there are two separate stages—Produce and Publish. This involves the action for completing the product (Produce), and presenting the proposed solution (Publish).

Debrief

This is the reflection stage where students get to own their learning. They look at the ways they succeeded, and ways they could improve their approach in similar future situations.

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DEFINE
Skills Perspective

In order for us to be able to solve a problem, we have to clearly define what the problem is first. We must decide exactly what it is that needs to be solved, and give proper context to the problem.

Restating/rephrasing the problem

- Restating/rephrasing the problem gets you thinking about it from different perspectives, leading to more versatile solutions
- It reveals things about the problem that aren't obvious
- Rephrasing can lead to creating solutions for multiple problems
- Leads to hearing unique perspectives from others
- Helps us to see the challenge differently

Challenging assumptions

- Helps us understand how the problem may have originated
- Challenges us to consider an issue in different ways
- Helps us question assumptions that limit independent thought
- Teaches us to decide for ourselves what is right and true

Researching and gathering facts

- Provides opportunities for developing useful research/data analysis
- You discover surprising things about a problem you didn't know before
- Helps us avoid making assumptions and forming opinions without ample information
- It gives us time to think about why finding a solution to the problem is important

DEFINE
Skills Perspective

In order for us to be able to solve a problem, we have to clearly define what the problem is first. We must decide exactly what it is that needs to be solved, and give proper context to the problem.

Chunking details together/breaking them down

- Breaking down details allows for better focus on the project as a whole
- Examining the details reveals how each component strings together logically in the overall project
- Team members can devote themselves to a specific project detail if they wish, depending on their individual strengths and talents

Considering multiple perspectives

- Helps us think of others and develop open-mindedness
- Urges us to consider the far-reaching effects of a problem or issue
- Guides us towards creating better solutions by considering others' needs
- Lets us empathize with other professional, creative, or cultural viewpoints
- Helps to develop our personal communication skills

Reversing the problem

- Reversing a problem can give you a better perspective on the problem's severity, and help you work towards a more effective solution
- Considering what could make a problem worse can lead you to solutions that may never have occurred to you
- It encourages a kind of lateral thinking about a problem, and allows us to brainstorm better solutions in a more uninhibited manner

DISCOVER
Skills Perspective

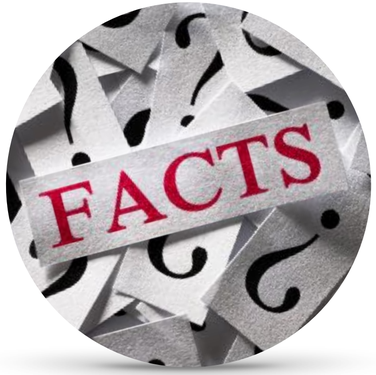
Discovery is the stage of research, gathering, and then analyzing knowledge. It gives the problem context so that we can identify with it easier, and come up with the best solution possible.

Locating information

- It teaches you effective search skills
- Creates an awareness that various sources may not always be as complete or as authoritative as they claim
- You develop habits of mind for asking the best possible questions
- You learn to be inquisitive and analytical about what you're trying to solve
- You will discover that sometimes you know more than you think you do

Skimming/scanning/scouring data for background

- You become able to determine at a glance what is useful to you if you have clearly defined your problem and know what you're looking for
- It helps you develop your organizational skills
- As you practice skim/scan/scour techniques you become more proficient with them, which helps you in future information quests
- You learn to cast a critical eye on all sources of information



Filtering

- Teaches us to identify facts and how they can be conveyed to inform or shape the opinions of the audience
- Fact-finding by filtering helps you to present your solution in a more unbiased manner
- Helps to differentiate fact from opinion
- Facts are central to properly supporting the ideas in your solution

DISCOVER
Skills Perspective

Discovery is the stage of research, gathering, and then analyzing knowledge. It gives the problem context so that we can identify with it easier, and come up with the best solution possible.

Taking smart notes

- Good note-taking works in tandem with training you to be a better listener
- You develop better information organization skills
- It encourages you to not be a mechanical writer, but rather to consider the real goal you have for taking notes on a certain subject
- It helps you learn to be brief, concise, and to focus on what's important

Analyzing, authenticating, and arranging materials

- Helps you learn to avoid taking what you see at face value
- Cultivates critical thinking skills
- It teaches you how to be analytical—and not cynical—about what information is on offer
- Authentication encourages the habit of checking information sources for validity and currency, an important practice for information gathering

DREAM
Skills Perspective

In the Dream stage, we open the heart and mind to possibilities and visions of a solution the way we wish to see it. This phase of Solution Fluency is about imagination, extrapolation, and visualization.

Generating wishes

- This skill allows us to break all bonds of our thinking, and envision a perfect solution to work backwards from
- It encourages us to be fearless in brainstorming and sharing our ideas
- Wishing inspires us and invokes a stronger drive towards finding solutions

Exploring possibilities

- Guides us toward challenging assumptions and beliefs that hold us back
- It teaches us to be brave and courageous with our vision
- Focusing on the possibilities teaches us to keep a positive frame of mind when solving problems
- We discover that the impossible may actually be possible sometimes

Imagining best-case scenarios

- Helps us remain inspired towards developing the best possible solution
- Encourages brainstorming activities that hone communication skills
- Lets us be free with our ideas, and develops positive and constructive mindsets among team members
- Guides us towards thinking in terms of possibilities and helps us transcend limited thinking

DREAM
Skills Perspective

In the Dream stage, we open the heart and mind to possibilities and visions of a solution the way we wish to see it. This phase of Solution Fluency is about imagination, extrapolation, and visualization.

Visualizing “time machine” visits to a perfect future

- The time machine visits help us continue to explore positive possibilities
- It provides an effective visualization exercise in which we can be clear about how we want our solution's outcome to look in real life
- It helps us envision a better world for present and future generations

DESIGN
Skills Perspective

In the Design phase we begin utilizing gathered knowledge to synthesize solutions. We create goals and milestones, assign team roles, and create systems of accountability for the team as a whole.

A clear focus on the future

- Proceeding with clear focus keeps everyone aligned towards the end goal
- It fosters the collaborative spirit by making sure everyone looks out for each other
- It offers a chance for team members to share initial opinions/concerns/ suggestions before the project development begins

Starting at the end and building backwards

- Creates a habit of logical, organized thinking
- Having a plan of action inspires confidence in yourself and team members in achieving the goal
- It eliminates the dangers and uncertainties of "flying blind"
- It introduces structure, and a clear strategy for progression in problem solving and project management

Creating instructions

- Instruction writing is a good communication practice for explaining the logical steps to a task
- It helps us to consider the viewpoints of others as we create a set of instructions that can be broadly understood
- This skill also works to develop logical patterns of thinking

DELIVER
Skills Perspective

The Deliver phase happens in two separate stages—*Produce* and *Publish*. It involves both completing the solution (Produce), and then making the actual presentation or demonstration (Publish).

Identifying the appropriate format for presentation

- Making use of the best visual solutions is critical for success in business and education alike
- It helps you learn how new technologies work and how they can be used in classroom projects
- You learn to focus on the message and how it shapes people's thinking, instead of just passively consuming what you see
- Guides you toward considering what you really want to accomplish with any message you want to share
- Lets you consider the delivery more carefully and critically
- You learn to become interested in others by getting to know about your audience beforehand

Demonstrating/presenting the solution

- Lets you test your solution by applying it against the challenge
- It gives you a chance to revisit other stages of Solution Fluency to refine and improve your solution
- Presenting your solution raises questions from both yourself and your audience as to what works and what could be improved
- It teaches you to respect and consider the opinions of others
- You learn confidence and how to share your opinions with others in a constructive manner

DEBRIEF
Skills Perspective

The students look at their project from beginning to end and really get to own their learning. They determine what could have been done better and ways they could improve their problem-solving approach in similar situations.

Revisiting and reflecting on the product/process

- It sets the tone for a more lengthy discussion about how the 6Ds were utilized in creating the solution to the challenge
- You learn more about "big picture" thinking and broader perspectives
- It develops collaborative communication skills

Asking good questions about the product/process

- Asking questions reveals what you can improve on when addressing similar problems in the future
- You can learn to improve processes to make them more versatile
- It continues the development of collaborative skills when working in teams
- It allows you to recognize the specific contributions of each team member

Internalizing and utilizing new learning

- Utilizing new learning is the only way to make it stick—the more you practice this process, the more unconscious or "fluent" it becomes
- Problem solving becomes easier with an internalized process like the 6Ds
- You begin to see problems as opportunities for greater learning
- You are better prepared to handle future challenges

How Do We Measure Solution Fluency?

This Fluency Snapshot tool is designed to help you evaluate the level of proficiency that you or your students have with Solution Fluency.

There are 10 statements for you to consider. As you move through the statements, choose a value you feel represents how well the individual or group has demonstrated that characteristic. Better still, have your students assess themselves and discuss the outcome.

You now have a baseline, and you can analyze the results to decide where focus and improvement may be needed.

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1 ASPIRING **2** ACCEPTABLE **3** ADMIRABLE **4** AWESOME

	1	2	3	4
Clearly and accurately defines the problem to be addressed				
Appropriately synthesizes information about the development of the problem				
Consistently envisions a range of creative solutions to real-world problems				
Considers many possible solutions before choosing the most appropriate and achievable one				
Develops a complete step-by-step plan for solving the problem				
Maintains a focus on the goals driving the problem-solving process				
Revisits/reflects critically on/revises the process at each stage				
Uses a wide range of media to communicate understanding of both the content and the process				
Reflects critically on how the product and process can be improved once a solution is developed				
Demonstrates adaptability and commitment by modifying the product and the process when weaknesses in either one are identified				

How Do We Use Solution Fluency in a Classroom?

With Solution Fluency you have a powerful tool to give to your students. It's a process that will serve them well in school and in life.

The question educators have most often is: *What does Solution Fluency look like in action in the classroom?*

We'll give you some simple tools for helping you understand how to apply the 6Ds process in your teaching. We'll also give you some project-based learning scenarios to use with your students. There are 2 each for primary, middle, and senior school. They're all versatile enough to be adapted for any grade you wish.

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Solution Fluency:
A Practical Approach

By far, the most important skill students will need for future success is the ability to solve complex and challenging problems. This is the sentiment shared by practically every educator we've asked across the globe.

When educators first see Solution Fluency, it looks familiar to them. They often say, "yes, we do that already." That's because the 6Ds process of Solution Fluency mirrors other processes they are already familiar with.

The chart on the right shows how the process of Solution Fluency echoes the stages of the Scientific Method, the Writing Process, the Media Production Process, and the Design Thinking Process.

These methodologies are all engineered to solve problems effectively and efficiently. So the idea of embedding Solution Fluency as a fluid and unconscious process in students' minds isn't really a stretch.

solution fluency	Scientific Method	Writing Process	Media Production	Design Thinking
Define	Aim	Prewriting	Preproduction	Define
Discover	Background/ Introduction	Prewriting	Preproduction	Research
Dream	Hypothesis	Prewriting	Preproduction	Ideation
Design	Equipment/ Method	Draft	Preproduction	Prototype/ Choose
Deliver (Produce)	Experiment	Revision/ Editing	Production	Implement
Deliver (Publish)	Results	Publish	Post Production	Implement
Debrief	Conclusion	Review	Review	Learn

What Solution Fluency Is and Is Not

To help you better understand Solution Fluency, let's challenge common assumptions about it. Here's what Solution Fluency both is and is not.

Solution Fluency Is Not …	Solution Fluency Is …
A linear process. Solution Fluency isn't bound by the limitations and strictness that can be part of linear processes. It has a different more intuitive flow.	*A cyclical process.* All the phases of Solution Fluency are meant to be revisited in any learning journey. It doesn't always need to happen, but it can.
A long complicated process. Some teachers assume Solution Fluency takes days or weeks to implement. It can be used this way, but that's not the only way.	*A versatile process.* Solution Fluency can be applied to any task of any scale. It doesn't matter if you're making a grocery list or redesigning the universe!
Exclusive to a classroom. Solution Fluency isn't strictly a process for the modern classroom. True, it's purpose is for learning, but its power extends beyond school.	*A skill for life.* Solution Fluency teaches us crucial problem-solving, critical thinking, and analytical skills. It's a formula for success in every aspect of life.
An advanced thinking model. To some, Solution Fluency looks too complicated to work with every student. As such, teachers often have doubts about its simplicity.	*A skill for everyone.* An eye-opening moment for us was when we saw 4-year-old children explaining the 6Ds to their parents. Solution Fluency is that simple!

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Guiding Questions for Solution Fluency

Understanding how to use Solution Fluency in a classroom setting means asking guiding questions at every phase. Suggestions for each phase are listed below.

Define: *What are the details of the challenge we face? What do we want to overcome specifically? What do we want to solve?*

Discover: *What do I need to know and what do I need to be able to do? Why do we need this to happen? Why hasn't it been done previously? If it has, why wasn't it successful? What can we change?*

Dream: *What do we truly want to create? How will it function? What will it look like? What's our best-case scenario for the end goal?*

Design: *What does it look like "on paper"? How will we create and implement it? What are the steps we must take? What are the milestones and guidelines we will set for ourselves? How will we ensure everything is being done right and on time? How will we deal with problems?*

Deliver: *How do we bring this idea into functional reality? How do we practically apply what we've done? How will we present this to people? How will we know it's working?*

Debrief: *What were the results of our efforts? How did we succeed or fall short of accomplishing our goal? What went well, and what didn't? How can we improve our efforts and outcome in the future? How can we apply what we've done to similar problems?*

PRIMARY SCHOOL SCENARIO

Brainy Inventions

How can knowledge of the local and global market help us to improve an invention, gadget, or tool?

Subjects

Math, History, Arts, Science, Language Arts, Design

Challenge

What do you do when an invention or gadget is no longer as useful to people as it once was? Give it an update, and use Solution Fluency to breathe new life into an old idea!

Your group of inventors will add an improvement or redesign to an obsolete invention or gadget to make it work better and once again become useful to people.

Choose to either create a new gadget or select a gadget to redesign in order to produce and sell it to the public. You must identify the price for the product by comparing it with other similar gadgets on the market.

Use creative designs, storytelling, mathematics, and science to work with your team and make something that's old brand new again!

- ✓ **DEFINE:** Students pick an invention to improve on and learn about how it was created. They'll also think about how it could perform better than it does now.
- ✓ **DISCOVER:** Get students to think of how the gadget will be improved compared to other gadgets or a previous version. What are similar inventions doing that's better?
- ✓ **DREAM:** Students now imagine their ideal redesign or reconstruction of their invention for the public. How will these improvements help people? What is their dream?
- ✓ **DESIGN:** The group will begin charting out their new improvements and get them down on paper. They can also build models for interactivity and for demonstration.
- ✓ **DELIVER:** Students now present thier improved invention. Have them describe what they improved, how they did it, and why they felt it was a necessary upgrade.
- ✓ **DEBRIEF:** What were the challenges of redesigning or recreating this gadget? If they could choose a different gadget to produce, what would it be and why?

PRIMARY SCHOOL SCENARIO

Hidden Treasure

How can your knowledge of science and geography help with making decisions when searching for precious gems and metals?

Subjects

Geography, Science, Language Arts, Technology

Challenge

What would it be like to hunt for hidden treasure? A local mine is struggling to find new deposits. If no new mineral deposits are found soon, the mine will face closure and many people in your area will lose their jobs.

In the movies, a treasure map usually leads to a location marked “X” where there is an old wooden chest full of gold coins and sparkling jewels. In real life it is more likely that precious metals and valuable gemstones are discovered by following a map based on science and geography.

You and your friends have decided to create a treasure map that shows possible locations where such precious metals and gemstones could be found. Present your map with at least 5 locations for mineral deposits, and give descriptions of how these minerals are formed. Rock on!

- ✓ **DEFINE:** Students must create a map of locations where five different precious metals and gemstones can be found, along with science-based hints for finding and retrieving them.
- ✓ **DISCOVER:** Explore different types of precious stones and metals. Have students investigate locations, the geological processes that form them, and how they’re mined.
- ✓ **DREAM:** Students now get to visualize in detail what their map will look like. Also encourage them to think about their presentations and how they want them to look.
- ✓ **DESIGN:** The groups begin designing their maps and deciding what information will be included in them, and what designs and content will be included in their presentations.
- ✓ **DELIVER:** Students deliver their presentations, including their maps. Afterwards, they should be prepared to answer any questions about their project development.
- ✓ **DEBRIEF:** Let students discuss feedback. Have them share those aspects of their maps and presentations that they thought were best, and what could have been better.

MIDDLE SCHOOL SCENARIO

Photo Power

How does littering affect our health and the environment?

Subjects

Language Arts, Science, Social Studies, Design, Environmental Studies

Challenge

In advertising and news media, the pictures that we choose are usually accompanied by a single line or headline. These captions are meant to be just as powerful as the image they accompany. It takes a keen eye and an intuitive mind to explain an image with only a few words.

Your advertising team has been approached by the local chapter of a large environmentalist group. They want you to create a poster and e-brochure designed to bring awareness to the problem of litter in your community.

In your designs, use powerful images and write “action statements” for each one. Provide statistics that define littering as a growing problem and its effects on the environment, and suggestions for what can be done to address the concern.

- ✓ **DEFINE:** Students will be designing a brochure and concept poster about the effects of litter, including strong imagery and powerful thought-provoking “action statements.”
- ✓ **DISCOVER:** Encourage students to explore the harmful effects of litter. What caused our society to become less caring about the environment and begin polluting it?
- ✓ **DREAM:** Have students envision the literature they’d design that shows the devastating effects of ignoring the litter pollution problem to the people causing it.
- ✓ **DESIGN:** Students can begin collecting/creating images and decide which are the best and most compelling. They can also start writing captions for the photos they’ll use.
- ✓ **DELIVER:** Each group begins assembling their project for presentation using methods of review and revision to finalize the project’s components. They can then present them.
- ✓ **DEBRIEF:** Encourage students to reflect on what they know now that they didn’t know before about the environmental and personal impact of littering.

MIDDLE SCHOOL SCENARIO

Design Stardom

How can interior designers use math to bring their visions to life?

Subjects

Math, Language Arts, Design, Art, Technology, Digital Media

Challenge

A successful designer is one who has an innate sense of style and a solid mathematical foundation. Could you succeed in the design industry? This is a great way to find out.

Select a messy or uninspiring space to redesign, and build a scale model to display your vision. Plan the new design and build a diorama that displays the major lengths, widths, and heights of the space to scale. Then put your design mojo to work.

This will call upon all your creative and mathematical talents. Draw inspiration from your favourite designs. Chat with industry professionals and learn how they approach design challenges.

You can create a video or slideshow that captures the design process along with “before” shots of the chosen space and “after” shots of your scale model. Design your perfect space!

- ✓ **DEFINE:** Students will redesign spaces of their choosing. They’ll calculate, measure, and write mathematical narratives, and create a video, slides, or before-and-after shots.
- ✓ **DISCOVER:** Let students consider what space they might like to redesign and how they’d like to change it. Encourage them to think about who will benefit from the remodel.
- ✓ **DREAM:** Have them start writing down their ideas for a redesign. Also get them to think about the math and measuring that will be involved with each design element.
- ✓ **DESIGN:** The teams must now finalize their plans for the remodel and create a timeline with specific milestones, deadlines, and responsibilities.
- ✓ **DELIVER:** Have them complete their models and narratives, and use equations, ratios, and proportions to draw up a budget. They can then make their presentations.
- ✓ **DEBRIEF:** What did they learn about mathematics and interior design? Did the remodel require more or less math than they expected?

SENIOR SCHOOL SCENARIO

Jumping to Space

How can we use our knowledge of math and science to help with the concept of space travel?

Subjects

Mathematics, Science, Language Arts, Astronomy, Media, Technology

Challenge

Could space tourism ever become a reality? You certainly think so. Why not share your idea using the creative impact of digital media in designing an itinerary for an interstellar guided tour?

We know that a popular tour for visitors to Hollywood takes them to see homes of movie stars. What if we were to extend this concept to the stars of the universe along with moons, planets, asteroids, and other galactic locations?

Create a brochure or video outlining a guided space tour. Include some interesting information about the places you visit along the way. The numbers representing distances and other quantities involved in intergalactic space travel can be very large, so use both decimal and scientific notations in your tour. Take us on the ultimate trip through the cosmos!

- ✓ **DEFINE:** Students design a space tour explaining some interesting facts about three different locations, and including distance calculations using scientific notation.
- ✓ **DISCOVER:** Get students to look for ideas by researching the history of space travel. Books, TV shows, and films that portray space travel are other good resources.
- ✓ **DREAM:** Have them think about what destinations will be visited. What form of space travel will be used? How will the challenges of traveling great distances be overcome?
- ✓ **DESIGN:** Students now develop their space tour itinerary; represent, compare, and perform calculations involving very large and very small distances; and create the presentations.
- ✓ **DELIVER:** Students deliver their projects either digitally or in print form for review by teachers and peers. After the presentations, engage them in a discussion of their projects.
- ✓ **DEBRIEF:** Get them to share those aspects of their ideas that were most effective and to identify what, if anything, they would have done differently.

SENIOR SCHOOL SCENARIO

Feeding the Need

How does proper nutrition help sufferers of chronic illnesses?

Subjects

Science, Language Arts, Health, Nutrition, Design

Challenge

When the body is healthy, the mind is healthy and everything just feels good. But sometimes our systems become unbalanced due to chronic illnesses, and we turn to the healing power of food to restore the balance within us.

Your team is starting a small business as freelance nutritional counsellors. You have decided to make your expertise available to a wide range of people. To do that, you will need to develop a publication that features an interesting visual reference for food sources containing vitamins needed by the human body.

Develop a publication that is a handy reference for food sources containing vitamins needed by the human body. Include food sources that can help those suffering from a low level of vitamins C, D, B, and others. Create a guide for being a nutritional powerhouse!

- ✓ **DEFINE:** Students will create a publication on four different essential vitamins. This will include information on their functions in the body and what foods they can be found in.
- ✓ **DISCOVER:** Have them research essential vitamins and their purpose. Next, discover what illnesses result from a lack of these vitamins, and foods that combat the symptoms.
- ✓ **DREAM:** Students now visualize thier projects. Will they do posters or would a cool web page be better? What helpful information will they include about vitamins and foods?
- ✓ **DESIGN:** Students must provide information on four different vitamins and optimum food sources for each, and include healthy tips and facts (and even tasty recipes) for patients.
- ✓ **DELIVER:** Each group has a finished project for a nutritional resource. They are ready to present them to the teacher and class for critique and assessment.
- ✓ **DEBRIEF:** Ask students to reflect on their process. Get them to discuss how they feel about the responsibility of passing this vital information onto those who can benefit from it.

How Do We Assess Solution Fluency?

The following assessment framework is used for an even more in-depth evaluation of how your students are doing with Solution Fluency.

The framework consists of special rubrics for each of the 6Ds of Solution Fluency. Each one has 4 different phases of learning outcomes, and solid criteria for each phase.

The learning phases are based on Bloom's Digital Taxonomy, devised by Andrew Churches. The phases progress from LOTS (lower-order thinking skills to HOTS (higher-order thinking skills) between Phases 1 and 4.

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DEFINE

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Purpose	Develops a definition that is a repeat of the stimulus material.	Develops a definition that shows an understanding of the task/s and how skills will be applied to the process.	Develops a definition by removing extraneous information. The task/definition is broken down into component elements. Elements are sequenced in a logical progression.	Develops a definition that shows critical reflection on the task. The task/definition is broken down into component elements. Elements are sequenced in a logical progression. Evaluates the definition for completeness.
Independence	Llittle independence is shown. Extensive support to develop or adapt the definition is required.	Some independence is demonstrated. Seeks teacher or peer feedback to successfully develop or adapt the definition.	Shows abillty to break the task into elements and work through them with a degree of independence and self management. Feedback is analyzed to consider its merit, utilizing it if appropriate. Little input from the teacher is required to successfully develop or adapt the definition.	Demonstrates an ability to be self critical, monitoring their own progress and reflecting on it. Shows ability to modify their planning and schedule as a result. Requires little or no input from the teacher to successfully develop or adapt the definition.
Accuracy and Clarity	Develops a basic definition that would enable a solution.	Develops a definition that would enable the production of a successful solution. The definition sets some of the success criteria.	Develops a definition that would enable the production of a successful solution. The definition is broken down into its component parts and includes most of the success criteria for the solution.	Develops a definition that would enable the production of a successful solution. The definition is clear and concise and has been (where required) revised to remove extraneous information. The definition includes detailed success criteria for the solution.
Critical Reflection	The definition is not revisited or revised during the Solution Fluency process.	The task may be adapted during the Solution Fluency process.	The task definition is broken down into the component parts and the relationship between each is identified. The analysis is updated as further information comes to hand.	The task definition is critically reviewed and adapted (if required) while progressing through the Solution Fluency process.

DISCOVER

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Develops questions	Identifies keywords and states basic questions to collect some pertinent information based on the definition. Some questions and keywords are redundant or irrelevant. Many questions are closed.	Identifies a suitable range of relevant keywords and uses these to develop some probing and inquiring questions. Most questions are task-focused and will yield useful information. There are few closed questions.	The problem is broken down into its component parts and a suitable range of relevant keywords is identified. These are used to develop a range of inquiry questions that are focused on the problem. The questions enable effective and efficient access to information.	Identifies a suitable range of relevant keywords and uses these to develop a range of inquiry questions that are focused on the definition and that enable effective and efficient access to a broad and suitable range of information sources. Reflects on and refines the questions as required.
Accesses suitable information sources	Accesses the provided resources.	Accesses a range of resources, including and beyond provided options. Most sources are suitable and/or authoritative.	Accesses a range of select and suitable/ authoritative resources, which could include appropriate primary sources.	Creatively accesses a broad range of suitable and imaginative resources, which could include primary sources.
Validates information	Does not validate information for accuracy or factual basis.	Applies basic techniques for validating information sources.	Applies a variety of suitable techniques to evaluate the validity of each information source. Provides multiple information sources to support critical information. Can break down information into its component parts and compare the validity of different elements.	Applies a variety of suitable techniques to critically evaluate the validity of each information source. Provides multiple information sources to support critical information. Can break down information into component parts and evaluate the validity of different elements. Can justify the process undertaken and the validity of the information.
Applies information	Makes some use of the collected information. Much of the information is in its original form. There is little refining of the information.	Applies the collected information to develop a broad understanding of the task, its background, etc. Will sometimes recognize areas of limited information or validity, and will refine searches or instigate new ones.	Uses the collected and collated information to structure the task. Reviews the information and makes critical judgements on the depth/ breadth of knowledge required for the task. Recognizes areas of limited information or validity, and will refine searches or undertake new searches to correct these. Includes some evaluation of the validity and accuracy of information.	Creatively uses processed information to structure the task. Critically reviews information and makes judgements on the depth/breadth of information. Applies information from multiple sources and mediums using imaginative and focused strategies and techniques. Recognizes areas of limited information or validity and will refine or undertake new searches to correct these. Includes evaluation of the validity and accuracy of information.

DISCOVER

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Records and acknowledges information sources	Recalls a simple list of resources used with little or no formatting or processing.	Applies suitable citation techniques to develop an appropriate bibliography.	Consistently uses methods to provide a detailed bibliography of information sources. Sources are suitably organized/presented. Primary information sources are acknowledged, and permission is asked to use them if appropriate.	Consistently and accurately uses methods to provide a detailed bibliography of information sources. Sources are creatively organized/presented. Primary information sources are fully acknowledged, and permission is sought to use resources if appropriate.

DREAM

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Identifies the audience and considers their needs, preferences, and motivations	Can Identify the outcome and the audience.	Identifies and states the audience. Outlines some of the requirements of the audience.	Is able to evaluate most of the needs of the audience and relate these to the task.	Is able to evaluate, in depth, the needs of the audience and relate these to the task/outcome in detail.
Combines elements of different stimuli and sources, personal experiences and underlying principles of the medium	Views different sources that might apply to the task and definition.	Considers a limited range of sources, and some of the underlying rules of the medium as they apply to the task and definition.	Considers different stimuli and sources, their own personal experiences, and some of the underlying rules of the medium as they apply to the task and definition.	Creatively and imaginatively considers different stimuli and sources, their own personal experiences and preferences, and the underlying rules of the medium or elements of the material as they apply to the task and definition.
Presents a range of solutions (when possible) and considers the most appropriate and achievable one	A single solution is proposed which will address some of the components of the problem. Struggles to consider the viability/ feasibility of the solution.	A solution or a limited number of solutions that would address the majority of the components of the problem are proposed. Applies some criteria to select the solution.	A range of solutions that will solve the problem is proposed. The different components of the problem are identified for each solution. The solution is selected based on the success criteria. Some justification of the selection can be provided.	A range of creative and imaginative solutions which will solve the problem are proposed. The proposed solutions are linked to stimulus material and resources they have discovered. There is critical reflection on the positives and negatives of each solution. The success criteria is used to select the most feasible solution for further development. Their decision is justified clearly.
Communicates solution, decision and selection process effectively	Can outline their decision and selection process.	Can describe and/or explain their solution to the problem, their decisions and their selection process.	Can analyze their solution to the problem and their decisions and selection process.	Can fluently and articulately justify their selection, judgement, critique, decisions and process/es.

DESIGN

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Develops a complete plan, schematic or similar design concept for the solution	Develops a plan that would create some of the aspects of the product successfully. A number of areas of development are incomplete or outlined only briefly. The plan contains insufficient details to allow for a clear understanding of the process.	Develops a plan that will lead to the development of a product or solution. Most of the areas of development of the product are covered. The plan contains details that would allow the product to be created, but a third party would struggle to understand the process clearly.	Breaks down the overall plan into suitable parts/components. Analyzes the plan to ensure all elements are accounted for. Evaluates and modifies the plan, timeline or design to ensure that the product will be produced.	Develops a creative design to produce the product. Uses the rules of the medium to develop the completed design. The design is complete and has suitable detail in all of the component parts. The plan is analyzed and broken down into suitable parts. The plan, process and product are evaluated against the definition and the envisioned solution. Changes are justifiable.
Breaks down the process into suitable phases, tasks or steps	Produces a list of stages or steps.	Produces a logical list of stages or steps. Provides some detail for each stage/step. The plan is clear enough that a third party could understand the process being planned/undertaken.	Analyzes the product and breaks the task into suitable stages. Each stage is suitably detailed and considered. Stages are logically sequenced. The plan is sufficiently detailed and structured so that a third party could easily understand the process.	Analyzes the product and breaks the task into suitable stages. Each stage is suitably detailed and considered. Stages are logically sequenced. Evaluates the efficiency of the process and modifies dynamically as required. The plan is sufficiently detailed and structured that a third party could easily understand the process.
Assigns time for each stage	Assigns a time to each stage with little consideration of the complexity of the stage or step.	Assigns a time to each stage with consideration of the complexity of the stage/step. Much of the timing is realistic.	Produces a realistic estimation. Evaluates time assigned to each stage. Adjusts and modifies process as required. Informs stakeholders of significant changes with some evaluation of reasons for changes.	Produces a realistic and mostly accurate estimation. Has considered a wide range of factors in the development of the timing for the stages and has included contingency and flexibility. Critically evaluates time assigned to each stage. Can apply suitable planning and management models to provide structure. Adjusts and modifies process as required. Informs stakeholders of significant changes with detailed evaluation of reasons for changes.
Assigns responsibility for aspects of the development as required	Assigns each team member a role.	Assigns roles to team members. Has considered some of the limiting factors and abilities of the team when assigning roles. Checks on progress and updates the schedule.	Analyzes the tasks and assigns roles. Balances the workload with some consideration of the strengths and abilities of the team members. Considers most of the limiting factors. Frequently checks on progress and updates the schedule.	Analyzes the tasks and evaluates strengths of all team members. Assigns tasks based on suitability, availability and skill sets of the team members. Considers limiting factors. Frequently analyzes progress and evaluates deadlines and task objectives, adjusting these as required.

DESIGN

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Considers feasibility of the solution	Selects a product with minimal consideration for feasibility or suitability.	Briefly considers some of the factors of feasibility and suitability before accepting or rejecting the solution.	Considers the feasibility of the solution by breaking down the feasibility into component parts including time, skills, cost, availability of materials, hardware, and software. Considers the purpose of the product and requirements of the target audience. Checks the solution against the success criteria before accepting or rejecting the product/solution.	Evaluates the feasibility of the solution as criteria for selecting the design of the product. Considers a range of factors including time, skills, cost, availability of materials, hardware, and software. Considers the purpose of the product and the requirements of the target audience. Where necessary, considers marketability, appropriateness and sustainability. Checks the solution against the success criteria. Modifies the solution or selects a new solution if the product is not feasible.

DELIVER

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Revisits, reflects critically on, and revises the process at each stage and maintains a focus on the goals driving the problem-solving process	The plan is referred to periodically. Can state the stage of the plan they are at. Support is needed to remain on task and focused.	Monitors their progress against the plan. There is some reflection on how the process and/or product is being undertaken. Aspects needing revision can be identified and changes applied. Has a suitable level of focus of the outcome and goals of the process.	Monitors and evaluates progress. Offers some reflection on the process and/or product, and how this could be improved. Aspects needing revision can be identified and suitable changes applied. Is partly able to justify their modifications and decisions. Maintains a focus on the goals and outcomes.	Evaluates their progress and critically reflects on the process and product and how they could be improved. Makes suitable modifications to the process and can provide detailed justifications of these. Maintains a consistent focus on the overall goals and outcomes, considering these critically when adapting and modifying.
Produces the product consistently with the design	A product/outcome that is only partially functional or complete is developed. The product addresses some of the success criteria and is partly suitable for the audience or purpose.	A product is developed that is mostly consistent with the design. The product meets some of the success criteria and is functional.	A product is developed that is suitable for the purpose and audience. The product is consistent with the design. The product meets most of the success criteria and is functional. Changes from the original plan, process or design can be identified and some of these can be justified.	A product is developed that is suitable for the purpose and audience and is consistent with the design. The product meets the success criteria and is fully functional. The product shows care and attention to detail. Any changes from the original plan, process or design are fully justified.
Produces the product/s within the constraints/success criteria set in design stage	Struggles to remain within the constraints for the process. Has some awareness of the limitations, restrictions, etc.	Applies the criteria and generally remains within the constraints of the process. Is able to state the goals, outcomes and limitations of the process and product.	Consistently analyzes and breaks down the process/product and compares against the success criteria. Will offer some/limited evaluation and sometimes revises the design, success criteria, and plan. Can partly justify changes and modifications.	Consistently analyzes and evaluates the process and product against the success criteria to ensure accuracy. Evaluates and revises the design, success criteria, and plan as required. Is able to justify the changes and modifications as required. Informs stakeholders of substantial changes if required.
Efficiency and accuracy	Is sometimes accurate in their execution of the plan or development of the product.	Can apply the plan or design with some accuracy. There is some wastage in terms of time, effort, and materials/resources.	Generally works efficiently. There is minimal wastage in terms of time, effort, and materials/resources. The work is generally accurate in the execution of their plan, the development of the product, and the reflection.	Works with efficiency and in a manner that is economical in terms of time, effort, and materials/resources. Works with accuracy in the execution of their plan, the development of the product, and the reflection.

DEBRIEF

	Phase 1 awareness, connection, remembering	Phase 2 understanding, applying	Phase 3 analyzing, evaluating	Phase 4 evaluating, creating
Demonstrates adaptability and commitment by modifying the product and the process when weaknesses in either are identified	Struggled to remain on task and within the constraints for the process.	Applied the criteria and generally remained within the constraints of the process. There was little or no deviation from, or modification of, the original plan or design.	Has analyzed and broken down the process/product. Progress was compared against the success criteria and plan. Design, success criteria, and plan were sometimes revised. Some/limited evaluation was offered, and changes and modifications can be partly justified.	Has consistently analyzed and evaluated the process and product against the success criteria, plan and process to ensure accuracy. They have evaluated and revised the success criteria, plan, design and/or product as required. The student can justify the changes and modifications.
Reflects critically on how the product and process can be improved once a solution is developed	The reflection is often superficial and incomplete. Some next steps may have been offered, but these are not linked to the reflection.	Some reflection on the different stages of the process undertaken can be provided. Reflection is generally fair and appropriate. Some valid next steps are proposed.	A suitable analysis (stage by stage) and some evaluation of the process undertaken can be provided. Reflection is fair, considered, deliberate, and appropriate overall. Reflection is considered and some next steps are provided based on the evaluation.	A clear and concise evaluation of the process undertaken can be provided. Reflection is fair, considered, deliberate, and appropriate. A detailed reflection is provided, and then clear next steps are developed in consideration of this (where required).

Guiding Questions

1. What do you feel are the defining characteristics of an exceptional problem solver?
2. What are the reasons why developing independent problem-solving skills in students is being given such high focus in modern education around the world?
3. How do you feel you are already using Solution Fluency in your current teaching practices?
4. In what situations and environments, other than educational ones, do you feel Solution Fluency can be applied in our daily lives?
5. How does the cyclical nature of Solution Fluency benefit those using this process in learning?
6. What are you going to begin doing *right now* to incorporate Solution Fluency into your own classrooms, and how can we help?

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