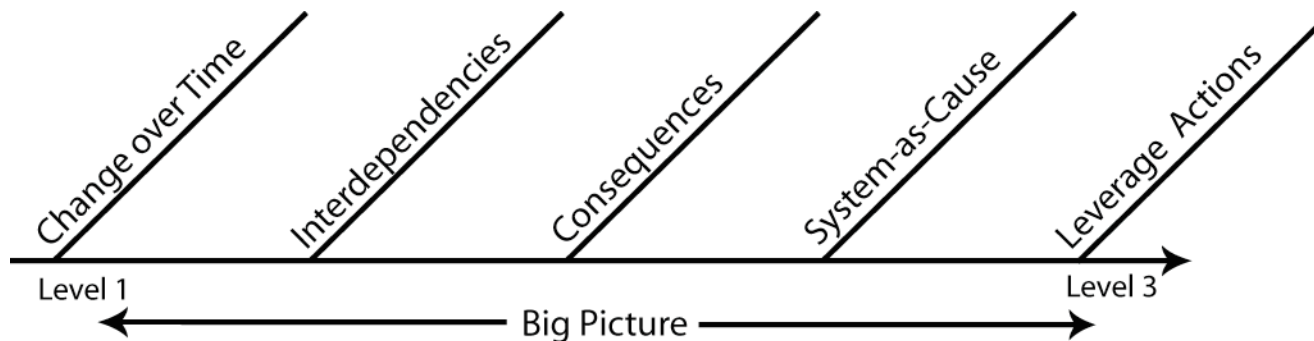


CFSD 21st Century Learning Rubric

Skill: Systems Thinking


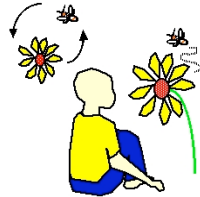




- **Systems Thinking – Beginner** (designed for instructor use), pages 1-2
These rubrics were designed for use with primary students and/or students who are just beginning to learn systems thinking concepts and strategies.
- **Systems Thinking – Beginner** (designed for student use), pages 3-4
These rubrics were reworded based on the rubrics on pages 1-2 to simplify the language and systems thinking terminology. They were designed for use by primary students and/or students who are just beginning to learn systems thinking concepts and strategies.
- **Systems Thinking – Concept Rubrics** (designed for instructor and/or student use), pages 5-10
These rubrics were designed for intermediate grade → high school students and/or students who have reached a more advanced understanding of systems thinking concepts and strategies.
 - Big Picture, page 5
 - Change over Time, page 6
 - Interdependencies, page 7
 - Consequences, page 8
 - System-as-Cause, page 9
 - Leverage Actions, page 10

A continuum of systems thinking rubrics corresponding to performance levels within CFSD's 21st Century Skills



Systems Thinking Rubrics

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Systems Thinking – Beginner

Traits	Novice	Basic	Proficient	Advanced
Big Picture	<ul style="list-style-type: none"> Gets bogged down in the details of a situation. Isn't sure which parts are more or less important. Sees only own point of view. 	<ul style="list-style-type: none"> Identifies parts of a system but cannot explain how they create a whole. Shares and listens to other points of view but does not consider how they might increase understanding. 	<ul style="list-style-type: none"> Focuses on and explains how parts of a system come together to make a whole. Remains open to other points of view. 	<ul style="list-style-type: none"> Focuses on and explains clearly how the parts of a system come together to make a whole. Recognizes and explains how one's thinking affects what happens. Seeks out and considers other points of view.
Change over Time	<ul style="list-style-type: none"> Lists and orders events but cannot tell the difference between key events and less important events. Describes change at an event level, e.g. changing clothes. 	<ul style="list-style-type: none"> Identifies and orders key events. Cannot identify elements of the system that are changing over time. Describes change as a series of events that connect over time. 	<ul style="list-style-type: none"> Identifies and orders key events. Identifies elements of the system that are changing over time. Describes change as a series of events that are connected in time to produce a particular pattern of behavior. 	<ul style="list-style-type: none"> Uses an understanding of event sequence to identify a time frame and the degree to which one or more elements change over time. Describes change as a continuous trend over time. Compares different patterns of behavior.
Interdependencies	<ul style="list-style-type: none"> Explains that an event happened but cannot identify a cause. 	<ul style="list-style-type: none"> Explains cause and effect as one event or part of a system directly causing a change in a second event or part. 	<ul style="list-style-type: none"> Explains cause and effect as happening in a circular fashion. 	<ul style="list-style-type: none"> Identifies and explains cause and effect as happening in a circular fashion. Describes how causes and effects repeat over a period of time.
Consequences	<ul style="list-style-type: none"> Understands that actions can affect what happens but is unable to identify or explain any specific examples. 	<ul style="list-style-type: none"> Gives an example of how a specific action can affect what happens in the short-term. 	<ul style="list-style-type: none"> Given a specific situation, accurately explains how specific actions affect what happens in the short-term and the long-term. Explains how actions can create consequences, both wanted and unwanted. 	<ul style="list-style-type: none"> Without prompting, identifies and clearly explains how and why specific short and long-term results occur or may occur due to a specific action. Explains using specific examples how actions can create consequences, both wanted and unwanted.

Systems Thinking – Beginner

Traits	Novice	Basic	Proficient	Advanced
System-as-Cause	<ul style="list-style-type: none"> Describes behaviors in a system as unrelated to any part of the system. 	<ul style="list-style-type: none"> Describes behaviors in a system as related only to specific parts of the system or individual events. 	<ul style="list-style-type: none"> Recognizes and describes how a system's organization creates its behaviors over time. 	<ul style="list-style-type: none"> Identifies and explains reasons why specific behaviors result from the organization of a system.
Leverage	<ul style="list-style-type: none"> Describes basic concept of leverage, i.e. an action that would bring about a desirable effect, but cannot explain any examples. 	<ul style="list-style-type: none"> Given a specific situation, identifies an action but cannot support why it is or is not leverage. 	<ul style="list-style-type: none"> Given a specific situation, identifies and explains a leverage action that had or could have a significant desirable effect on results. 	<ul style="list-style-type: none"> Evaluates a situation carefully in order to propose leverage actions that would potentially have the greatest desirable effect, i.e. high leverage actions. Compares a high leverage action to a low leverage action.
Representations of a System/Systems Concept(s)	<ul style="list-style-type: none"> Creates a representation of a system/systems thinking concept that is incomplete and confusing. 	<ul style="list-style-type: none"> Creates a representation of a system/systems thinking concept that has some omissions and confusing aspects that affect clarity. 	<ul style="list-style-type: none"> Creates a clear representation of a system/systems thinking concepts that is mostly complete. 	<ul style="list-style-type: none"> Creates a clear and accurate representation of a system/systems thinking concept.
Transfer Understanding to Another Situation	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Transfers understanding of one situation to another situation in a way that is not comparable. 	<ul style="list-style-type: none"> Transfers understanding of known system parts and behaviors by making a comparison to another situation of the same type, e.g. the happiness of two characters in a book. Identifies the similarities and differences between the two situations using appropriate systems vocabulary. 	<ul style="list-style-type: none"> Transfers understanding of known system parts and behaviors by making a comparison to another situation of a different type that operates in a similar manner, e.g. the happiness of a character in a book and the happiness of him/herself. Identifies and explains the similarities and differences between the two situations using appropriate systems vocabulary.

	Keep working at it. 	You're getting close. 	You've got It! 	Wow! 
Big Picture 	<ul style="list-style-type: none"> I'm not sure which parts are important. I have trouble listening to other people's ideas. 	<ul style="list-style-type: none"> I know which parts are important, but I'm not sure how they all work together. I share my ideas with others and try to listen to other people's ideas. 	<ul style="list-style-type: none"> I see how the parts work together and can explain my thinking. I try to understand other people's thinking and their thinking helps me to figure out how things work. 	<ul style="list-style-type: none"> I see how the parts work together and can explain my thinking in a way that is very clear to other people. I explain that how people think can change what happens.
Change over Time 	<ul style="list-style-type: none"> I make a list of what happened, but I'm not sure which parts are really important. I'm not sure how something can change over time. 	<ul style="list-style-type: none"> I make a list of what happened in order, but I'm not sure what's changing. I see that everything that happens is connected together. 	<ul style="list-style-type: none"> I put important events in order. I can figure out what is changing over time and can explain how it is changing. 	<ul style="list-style-type: none"> I can find something that is changing over time. I can figure out the time it takes for change and how much something changes in that time.
Interdependencies 	<ul style="list-style-type: none"> I know that some things happen because of other things happening. 	<ul style="list-style-type: none"> I can explain how one part causes a change in another part. 	<ul style="list-style-type: none"> I can explain how one part changes a second part and how that comes back and changes the first part. 	<ul style="list-style-type: none"> I can explain and give examples of how "the parts affecting each other" works in a circle over and over.
Consequences 	<ul style="list-style-type: none"> I know that what I do changes what happens, but I can't think of an example. 	<ul style="list-style-type: none"> I can talk about a time when someone did something that caused something to happen right away. I can explain that sometimes what happens is "good" and sometimes it is "bad." 	<ul style="list-style-type: none"> I can talk about a time when someone did something that caused something to happen right away and later on, too. I can give an example of how what happens might be what I want or what I don't want. 	<ul style="list-style-type: none"> I can give examples and explain how what people do can affect what happens right away and a long time from now. I can give examples of consequences, both that are wanted and unwanted.

	Keep working at it. 	You're getting close. 	You've got It! 	Wow! 
System-as-Cause 	<ul style="list-style-type: none"> I can talk about what happened, but I'm not sure why it happened. 	<ul style="list-style-type: none"> I can talk about how one part makes certain things happen. 	<ul style="list-style-type: none"> I can explain that how something is put together makes it work the way it does. 	<ul style="list-style-type: none"> I can find and explain examples that show that how something is put together makes it work the way it does.
Leverage 	<ul style="list-style-type: none"> I can explain that doing something to make a change can work or not work, but I can't think of an example. 	<ul style="list-style-type: none"> I can think of a way to make a change, but I cannot explain why it's the best way. 	<ul style="list-style-type: none"> I can think of a way to make a change and explain why it is the best choice. 	<ul style="list-style-type: none"> I look at all the ways to make a change to find the best choice. I can explain why some choices are better than others.
Picture of what a System Looks Like 	<ul style="list-style-type: none"> I show my thinking in a way that others cannot understand. 	<ul style="list-style-type: none"> I show my thinking but I'm missing some parts and some parts are confusing. 	<ul style="list-style-type: none"> I show my thinking in a way that makes sense to other people. 	<ul style="list-style-type: none"> I show my thinking in a way that is very clear to other people.
Comparison to Another Similar Situation 	<ul style="list-style-type: none"> I'm not sure how what I learned is like another situation. 	<ul style="list-style-type: none"> I can think of another situation but it's not really the same. 	<ul style="list-style-type: none"> I can find another situation that is like what I learned. I can list how the two situations are the same and different. 	<ul style="list-style-type: none"> I can find something that is like what I learned, but in a different situation. I can list and talk about how the two situations are the same and different.

Systems Thinking - Big Picture

Traits	Novice	Basic	Proficient	Advanced
Identification and Explanation	<ul style="list-style-type: none"> Identifies and explains issues, goals, and/or problems within a system as individual details. 	<ul style="list-style-type: none"> Identifies and explains issues, goals, and/or problems within a system as a series of interrelated details. 	<ul style="list-style-type: none"> Identifies and explains issues, goals, and/or problems within a system from a wide, “big picture” view, rather than focusing on details. Seeks out and considers the different perspectives/ mental models underlying the system being considered. 	<ul style="list-style-type: none"> Identifies and explains issues, goals, and/or problems within a system from a wide, “big picture” view, rather than focusing on details. Gathers information about a system to form an overarching assessment of the situation.
Representations	<ul style="list-style-type: none"> Creates a model of a system that includes inconsequential elements and/or too many details. 	<ul style="list-style-type: none"> Creates a model of a system that includes only the interrelationships among details. 	<ul style="list-style-type: none"> Creates a model of the system’s relevant set of relationships by taking a whole-system perspective on an issue or process. 	<ul style="list-style-type: none"> Creates the simplest possible model of a system, aggregating (generalizing) detailed information to represent the whole-system perspective on an issue or process.
Transfer	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Transfers understanding of the interrelated details of one system to another system. 	<ul style="list-style-type: none"> Transfers understanding of “the big picture” of how one system operates by comparing it to another system of the same type. 	<ul style="list-style-type: none"> Transfers understanding of “the big picture” of how one system operates by comparing it to another system of a different type that operates in a similar manner.

Systems Thinking – Change over Time

Traits	Novice	Basic	Proficient	Advanced
Identification and Explanation	<ul style="list-style-type: none"> Identifies a change as occurring at a specific point in time. 	<ul style="list-style-type: none"> Identifies and explains change as a series of individual events that are connected in time. 	<ul style="list-style-type: none"> Identifies and explains a distinct system component's continuous pattern of change/trend over a specified period of time. 	<ul style="list-style-type: none"> Identifies and explains a distinct system component's continuous pattern of change/trend over a specified period of time. Does one or more of the following: <ul style="list-style-type: none"> Projects a behavior into the future based on current trends. Identifies and explains the difference between changes in accumulations over time and the rates at which they change. Identifies, describes and distinguishes between changes in qualitative (e.g. happiness) vs. quantitative (e.g. population) entities that change over time.
Representation	<ul style="list-style-type: none"> Represents events, e.g. lists a sequence of events. 	<ul style="list-style-type: none"> Represents change as event-based, e.g. dots connected on a graph. 	<ul style="list-style-type: none"> Represents continuous change over time, e.g. on a line graph. 	<ul style="list-style-type: none"> Represents continuous change over time of more than one variable, e.g. on a line graph.
Transfer	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Attempts to transfer understanding of an identified change-over-time to a non-transferable situation. 	<ul style="list-style-type: none"> Transfers understanding of an identified change-over-time by comparing it to a situation of a similar type, e.g. perseverance over time for two characters in different texts. Identifies similarities and differences between the two patterns of change. 	<ul style="list-style-type: none"> Transfers understanding of an identified change-over-time by comparing it to a situation of a different type that operates in a similar manner, e.g. a fictional character's perseverance over time compared to that of an historic figure. Identifies similarities and differences between two patterns of change and explains why the similarities and differences exist.

Systems Thinking – Interdependencies

Traits	Novice	Basic	Proficient	Advanced
Identification and Explanation	<ul style="list-style-type: none"> Shows causal relationships as one-way, e.g. cause → effect. 	<ul style="list-style-type: none"> Identifies and explains a cause-and-effect loop once, but is unable to describe the loop as a reinforcing or balancing process over time. 	<ul style="list-style-type: none"> Identifies and explains causality in a system as an ongoing reinforcing or balancing process with effects feeding back to influence causes, and causes possibly affecting each other. 	<ul style="list-style-type: none"> Identifies and clearly explains the interdependent causal relationships in a system as ongoing reinforcing or balancing processes with effects feeding back to influence causes, and causes possibly affecting each other.
Representations	<ul style="list-style-type: none"> Connects elements of a system, but is unable to make a closed loop. 	<ul style="list-style-type: none"> Represents a circular causal relationship between two elements of a system. 	<ul style="list-style-type: none"> Represents causal feedback among two or more elements of a system and/or creates multiple loops that illustrate different. Represents causal feedback relationships as either reinforcing or balancing. 	<ul style="list-style-type: none"> Represents causal feedback among three or more elements of a system and/or creates interconnected multiple loops. Represents causal feedback relationships as either reinforcing or balancing. Describes how two or more interdependent feedback loops are comparably more or less powerful over time.
Transfer	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Transfers understanding of a cause-and-effect loop to another situation in a way that does not follow the same pattern. 	<ul style="list-style-type: none"> Transfers understanding of known causality in a system by comparing it to similar situation of the same type, e.g. biological growth of bacteria vs. a rabbit population. Explains how the new situation follows the same reinforcing or balancing pattern. 	<ul style="list-style-type: none"> Transfers understanding of known causality in a system by comparing it to a situation of a different type that operates in a similar manner, e.g. growth of bacteria and the spread of rumors. Explains how and why the new situation follows the same reinforcing or balancing pattern.

Systems Thinking – Consequences

Traits	Novice	Basic	Proficient	Advanced
Identification and Explanation	<ul style="list-style-type: none"> Explains that actions produce results but cannot identify any specific consequences of a particular action. Identifies at least one “consequence” but does not correctly attribute it to an originating action. 	<ul style="list-style-type: none"> Identifies short-term, intended consequences but cannot identify effects that have occurred or might occur in the long-term or results that were unintended. 	<ul style="list-style-type: none"> Identifies what short and long-term consequences, intended or unintended, have emerged within a system as a result of actions. Explains an example of “the most obvious solution” making a situation worse in the long term. 	<ul style="list-style-type: none"> Identifies what specific short and long-term consequences, intended or unintended, have emerged within a system and explains in detail why these consequences have occurred as a result of specific actions. Identifies how and explains why a proposed solution could potentially backfire.
Representations	<ul style="list-style-type: none"> Makes a list of results but cannot show how they originated from actions. Does not represent the short or long-term nature of consequences. 	<ul style="list-style-type: none"> Represents an identified short-term consequence, using a systems archetype or causal loop diagram. Does not represent any long-term or unintended consequences of actions. 	<ul style="list-style-type: none"> Represents how aspects of a situation inherently cause specific consequences over time. The representation could be made through a systems archetype, causal loop diagram, stock/flow diagram, and/or kinesthetic activity. 	<ul style="list-style-type: none"> Represents concisely how aspects of a situation inherently cause specific consequences over time by creating a running computer model/simulation.
Transfer	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Transfers understanding of consequences to another situation in a way that does not follow the same pattern of consequences. 	<ul style="list-style-type: none"> Transfers understanding of known short and long-term consequences by comparing it to a situation of a similar type, e.g. consequences of two different wars. Explains how the new situation follows the same pattern of consequences. 	<ul style="list-style-type: none"> Transfers understanding of known short and long-term consequences by comparing it to a situation of a different type that operates in a similar manner, e.g. consequences of a war compared to similar consequences relating to the immune system warding off a disease. Explains thoroughly how the new situation follows the same pattern of consequences. Explains potential short and long-term consequences as a result of specific actions, e.g. setting and working toward personal goals.

Systems Thinking – System-as-Cause

Traits	Novice	Basic	Proficient	Advanced
Identification and Explanation	<ul style="list-style-type: none"> Recognizes an accumulation within a system and names one or more factors influencing the increase or decrease of that accumulation. 	<ul style="list-style-type: none"> Recognizes and explains some interdependent elements of a system including accumulations and flows with at least one feedback relationship. 	<ul style="list-style-type: none"> Recognizes and clearly explains some interdependent elements of a system including key accumulations and flows, relevant boundaries, inherent time delays, and balancing and reinforcing feedback. 	<ul style="list-style-type: none"> Recognizes and clearly explains relevant interdependent elements of a system including key accumulations and flows, boundaries, inherent time delays, and balancing and reinforcing feedback.
Representations	<ul style="list-style-type: none"> Represents how an accumulation increases and/or decreases, but emphasizes a list of influencing factors. 	<ul style="list-style-type: none"> Represents some interdependent relationships affecting accumulations but emphasizes a list of influencing factors. Shows misconceptions about the relationships between accumulations and the rates at which they increase and decrease. 	<ul style="list-style-type: none"> Represents how the underlying structure of a system operates and produces particular behavior(s) over time. 	<ul style="list-style-type: none"> Represents concisely how the underlying structure of a system operates and produces particular behavior(s) over time.
Transfer	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Transfers understanding of known system structures to another situation that does not have comparable structures. 	<ul style="list-style-type: none"> Transfers understanding of known system structures by comparing it to a situation of a similar type, e.g. consequences of two different wars. Explains how the new situation is structured in a parallel manner and thus produces similar results over time. 	<ul style="list-style-type: none"> Transfers understanding of known system structures by comparing it to a situation of a different type that operates in a similar manner, e.g. consequences of a war compared to similar consequences relating to the immune system warding off a disease. Explains thoroughly how the new situation is structured in a parallel manner and thus produces similar results over time.

Systems Thinking – Leverage Actions

Traits	Novice	Basic	Proficient	Advanced
Identification and Explanation	<ul style="list-style-type: none"> Acknowledges that actions can have desirable and undesirable effects, but is unable to identify any historical or potential leverage actions, i.e. actions that bring about desirable effects. 	<ul style="list-style-type: none"> Identifies at least one leverage action in a given historical or current system. Given a challenge, uses understanding of system structures to identify and explain possible leverage actions. 	<ul style="list-style-type: none"> Identifies possible leverage and non-leverage actions within a specific system. Given a challenge, uses understanding of system structures and underlying mental models to identify and clearly explain possible leverage actions. 	<ul style="list-style-type: none"> Given a challenge, uses understanding of system structures and underlying mental models to identify and explain potential leverage actions clearly and concisely. Surfaces and tests assumptions about potential leverage actions within a real-world context, such as student-action committees, class projects, or community involvement.
Representations	<ul style="list-style-type: none"> Represents cause and effect relationships but doesn't identify an action that would be leverage in the system. 	<ul style="list-style-type: none"> Represents, with significant omissions how an action functions as leverage in a given system. The representation could be made through an iceberg model, systems archetype, stock/flow diagram, system dynamics computer model, or other means. 	<ul style="list-style-type: none"> Represents how an action functions as leverage in a given system. The representation could be made through an iceberg model, systems archetype, stock/flow diagram, system dynamics computer model, or other means. 	<ul style="list-style-type: none"> Represents clearly and concisely how an action functions as leverage in a given system. The representation could be made through an iceberg model, systems archetype, stock/flow diagram, system dynamics computer model, or other means.
Transfer	<ul style="list-style-type: none"> Does not attempt transfer. 	<ul style="list-style-type: none"> Transfers understanding of leverage action(s) within a system to another situation in a way that does not follow the same pattern of applying leverage/bringing about change. 	<ul style="list-style-type: none"> Transfers understanding of leverage action(s) within a system by comparing it to a situation of a similar type, e.g. leverage in bringing about change in two different laws. 	<ul style="list-style-type: none"> Transfers understanding of leverage action(s) within a system by comparing it to a situation of a different type that operates in a similar manner, e.g. changing a law compared to changing a policy in a school.