THINK ALOUD GUIDE

Think Aloud	
Also known as cognitive interviewing, student conferences, or student interviews.	
Goal	Teachers sit alongside students and conduct an interview. Students are provided the opportunity to demonstrate and explain their work or a particular task. Teachers ask questions that elicit understandings about students' content knowledge and skills.
Data collection	The following are some suggested approaches for data collection: ● Record student think-alouds with video or audio devices to playback and keep as a record of progress. ● Use a checklist to check-off demonstrated knowledge or skills as they happen in the session. ● Take notes of interesting student comments, demonstrated skills/knowledge or items for follow-up/feedback. ● Take photos of student work/artefacts.
Measuring achievement	● Use the achievement standards/content descriptors to break down indicators of achievement that you are looking to measure in the particular session. ● After reflecting on data recorded in the session, use a rubric to assess where students are at in their learning. ● Complete a checklist (after the session, or by completing the one used during the session) and provide a summary of what students have learned and opportunities for growth.
Process	● Have a timeframe in mind so that the session is focused. ● Sit alongside students - at eye level or beside them. ● Have students demonstrate or show you a piece of work they are working on or have completed. ● Start with a general invitation for students to describe or explain what they have done/are doing. ● Have pre-prepared indicators that you are looking for that explicitly identify skills/knowledge you are seeking for students to demonstrate in that particular session (e.g. on a checklist or rubric). ● Prepare a way to record data that is user-friendly during conversation, so that you can focus on the conversation. ● Have pre-prepared question prompts that invite students to demonstrate particular knowledge or skills.

Think Aloud (Question Guide)

Remembering		
Recalling relevant knowledge of previously learned content (e.g. facts, terms, basic concepts).		
What am I asking of students?	**Example question starters & prompts**	**Context examples**
1. Can the student **explain, name or recall** Digital Technologies facts, terms or concepts? 2. Can the student **point to, select or show you** something or a number of things that demonstrates their understanding of Digital Technologies topics?	● **Can you/How would you explain**…? ○ Is there another way you could rephrase that? ● **Can you recall**…? ○ Are there any others you can remember? ● **Can you list**…? ○ Can you tell me why you chose these? ● **What is**….? ○ How do you know this? ○ What makes you think this? ● **How would you describe**…? ○ Can you tell me the features..? ● **Can you choose/show/select/ point** ....the part of code that makes that part of the animation work? ○ What is that block/code called? ● **Where is**…? ○ Can you point to it/show it to me? ○ How do you know... ?	● Students demonstrate the working of their code and explain how their code works, along with key programming constructs. ● The student recalls how computers can transfer and store digital data. ● The student can explain how the binary system works. ● Looking at past and present technologies, the student recalls features and functions. ● The student is asked to sort peripheral devices into input or output.
What am I looking for? ● Accuracy of content knowledge, such as correct definitions, descriptions, examples. ● Ability to correctly respond to (by recalling, sorting, showing) questions posed to test their conceptual or factual knowledge. ● Depth of explanation/description, such as coverage of what is expected and level of detail. ● Correct terminology, in alignment of what is expected at their year level.		

Understanding

Demonstrate understanding of facts and ideas by organising, comparing, translating, interpreting, giving descriptors and stating main ideas.

What am I asking of students?	Example question starters & prompts	Context examples
1. Can the student demonstrate their **understanding of facts and ideas**? 2. Can the student **compare and contrast** or distinguish between two or more things? 3. Can they **organise information, such as by grouping or** 4. **Can they state main ideas or translate ideas**?	• **How would you classify/group**…? 　○ Can you tell me why you chose to group them that way? • **Can you explain how this works?** 　○ Can you show me as you tell me? • **How would you rephrase/describe**… ? 　○ • **In your own words, how would you describe**… ? 　○ Can you think of some adjectives? 　○ What are the features/functions? • **How would you summarise**… ? • **What is the main idea?** 　○ Why do you think this main idea is important? • **What is meant by**… ? 　○ How do you know? 　○ Can you provide an example? • **How would you compare/contrast**…? 　○ What are the key differences? • **How would you distinguish between** ….? 　○ What makes these two things different/similar?	• The student demonstrates how they would group/classify types of data. • Students collect and analyse data (or are provided with a data visualisation) and are asked to summarise key findings in the information or respond to a question posed by the teacher using the information. • The student explains the key elements of a story and how they have sequenced them in the correct order. • The student is asked to group technologies according to a feature or their purposes. • The student is asked to compare and contrast digital systems and/or software and how they are used for different purposes.

What am I looking for?

- Accuracy of facts or correctness of grouping or organising items or information.
- Ability to show or explain how they can compare and contrast, group or organise items based on properties, functions, features, etc.
- Ability to succinctly and accurately summarise key points, by applying abstraction (ignoring irrelevant information and summarising only the key information).

Application

Solve problems in new situations by applying acquired knowledge, facts, techniques and rules in a different, or new way.

What am I asking of students?	Example question starters & prompts	Context examples
• Can students **articulate how they**	• **How would you solve**... ? **What could be an**	• Students are asked to solve programming

define the problem that they are trying to solve?
- Can the student **describe their problem-solving process** and strategies they implement?
- Do students **select appropriate problem-solving techniques and strategies**?
- Do students **understand the concepts, facts and techniques** that underpin what they are doing or have done?

alternative solution?
  - What would you need to know/do to solve it?
- **How did you come up with the idea**?
  - Where did you start? What inspired you? What was the problem you were trying to solve? Why was this an important problem?
- **What problem are you trying to solve/ worked on solving**?
  - What was your end-goal? What data do you need? How will you measure success?
- **Can you walk me through how you solved that problem**?
  - Where did you start… what did you do next...?
- **How would you organise** …. ?
  - Can you show me? Why did you choose to organise it that way?
- **What would happen if**... ?
  - How do you know? Are there any other possible outcomes?
- **What questions would you ask to gather information about**…?
  - Why are those important questions? Are there any others you could ask? What do you hope to understand?
- **Did you encounter any problems/bugs** in your project?
  - How did you know there was a problem? Can you show me where the bug was? How did you solve it? Did you seek any help? What worked/didn't work… why?

challenges (navigating a robotic device or on a screen using software).
- Students are asked to write down questions they would ask to collect data for a research question.
- Students are asked to brainstorm and describe alternative ways to solve a particular problem.
- Students are invited to talk through their code (or present) a digital project they have created.
- Students are able to demonstrate how they count in binary by converting a set of numbers provided by a peer or teacher.

What am I looking for?

- Ability to clearly define the problem that they are trying to solve (which is defined by the student or has been posed by the teacher).
- Students are able to define a problem to solve that has a clear need/purpose for their solution.
- Appropriate selection of techniques and rules to solve problems.
- Ability to articulate the application of knowledge, facts, techniques and rules to solve problems.

Evaluation

Present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.		
What am I asking of students?	**Example question starters & prompts**	**Context examples**
Students are able to provide and articulate evaluations, including judgements, opinions, justifications and validity of ideas or work. **Students are able to develop and use a criteria** to guide evaluations or are able to use existing criteria.	**How could you improve**…[the solution/product].? - In what ways would you change it? **What criteria were you considering in your evaluation**? **What criteria would you use to assess**... ? - Why are these important criteria? **What do you think of** the… [product/solution]? What is your opinion of…? **What are the strengths/weaknesses** of... ? - Why is this a strength/weakness? - How could they improve the weakness? **How could you test**…? - Can you walk me through the steps? Is there another way to test it? How do you know if it's successful? What would success look like? **What would you do differently next time? What would you keep the same?** - Why? **Would it be better if…**[it had this feature]? - Why/why not?	- Students are asked to review a digital solution (such as a game or tool) that was created by themselves or someone else. - Students self- or peer-review a project. - Students evaluate an algorithm presented as a flowchart/pseudocode that was created by themselves or someone else. - Students evaluate an infographic that was created by themselves or someone else.

What am I looking for?

- Can the student evaluate and articulate feedback about their own or another's work? How many points can they raise in their evaluation, according to your expectations for their level?
- How detailed is the feedback? Do students provide sound justifications or reasons supporting their feedback/evaluations?
- Can the student propose ways to improve theirs or another's work through effective feedback?
- Can the student identify appropriate aspects that they are evaluating against or use a criteria provided to make an evaluation?

Creating

Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.

What am I asking of students?	Example question starters & prompts	Context examples

● Students can **demonstrate how they are able to combine learned knowledge and skills to create or generate ideas** for potential digital solutions.	● **Can you show me how you invented/created…**?
	  ○ What made you decide to do that? Can you show me how it works?
	  ○ What skills did you use? What subject knowledge did you need to know?
	● **How could you invent…? How would you solve…?**
	  ○ Do you think there would be some challenges with this solution? What skills and knowledge would you need?
	● **Can you recommend an alternative solution?**
	  ○ In what ways is this different? Does it require any different skills/knowledge to make?
	● **Can you talk me through the model that you created**… ?
	  ○ What is this element here? How does this relate to…?
	● **Can you predict the outcome if**… ?
	  ○ How would you know? What else might happen?
	● **Show me a way to solve…** ?
	  ○ What are you thinking here? Can you explain why you made that choice?
		● Students create a flowchart that represents an algorithm.
		● Students navigate a robot to achieve a goal.
		● Students modify a Scratch program to add a new element.
		● Students design a sketch for a new digital device.
		● Students create a graph/infographic that answers a particular question.

What am I looking for?

- The ability for students to combine learned content knowledge and skills to implement the project or to identify ways to solve a problem.
- Articulation of accurate content knowledge.
- Ability to describe problem-solving processes and other related skills to generate solutions.
- Ability to predict outcomes accurately.
- Ability to generate alternative solutions to a problem.

Bloom's Category	What am I looking for?	Example question starters & prompts	Context examples
Remembering Recalling relevant knowledge of previously learned content (e.g. facts, terms, basic concepts).	Questions that test students on their ability to recall content knowledge. This could be done by inviting students to explain, name or recall facts, terms or concepts. Alternatively, teachers can ask students to choose, point, select or show them something that demonstrates their understanding of the content knowledge.	● Can you explain…? ● Can you recall…? ● How would you explain…. ? ● Can you list…? ● What is….? ● How would you describe…? ● Can you choose/show/select/ point ...? ● Where is…?	● Students demonstrate the working of their code and explain how their code works, along with key programming constructs. ● The student student recalls how computers can transfer and stores digital data. ● Looking at past and present technologies, the student recalls features and functions. ● The student is asked to sort peripheral devices into input or output.
Understanding Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptors and stating main ideas.	Questions that invite students to demonstrate their understanding of facts and ideas, such as comparing and contrasting, organising, stating main ideas or translating ideas. For example, teachers might invite students to group or organise items to demonstrate their knowledge of attributes of items, or to rephrase or explain a main idea, or to compare and contrast two items.	How would you classify/group…? How would you compare/contrast…? How would you summarise… ? Can you explain how this works? How would you rephrase/describe… ? In your own words, how would you describe… ? What is the main idea? What is meant by… ? How would you distinguish between ….? What did you observe …?	● The student demonstrates how they would group/classify types of data. ● The student explains the key elements of a story and how they have sequenced them in the correct order. ● The student is asked to group technologies according to a feature or their purposes.
Application Solve problems in new situations by applying acquired knowledge, facts, techniques and rules in a different, or new way.	Questions that invite students to define and solve problems or describe problem-solving processes. Questions that elicit their understanding of concepts, facts and techniques and how they have been applied to solve problems or to solve new problems in front of the teacher.	How would you solve... ? How would you show your understanding of…? How did you come up with the idea? What problem are you trying to solve/ worked on solving? Can you walk me through how you solved that problem? How would you organise …. ? What would happen if... ? What questions would you ask to gather information about…? What other way could you solve …? What could be an alternative solution? Can you find where the problem/bug is? Can you tell me how you would find it?	● Students are asked to solve programming challenges (navigating a robotic device or on a screen using software). ● Students are asked to write down questions they would ask to collect data for a research question. ● Students are asked to brainstorm and describe alternative ways to solve a particular problem.
Evaluation	Questions that invite students to voice evaluations, including judgements, opinions, justifications and	How could you improve….? What criteria would you use to assess... ?	● Students are asked to review a digital solution (such as a game or tool) that was created by

Present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.	validity of ideas or work. Teachers might provide a criteria for students to evaluate against, or this could be student defined.	What is your opinion of…? What are the strengths/weaknesses of... ? How could you test…? Would it be better if…?	themselves or someone else. ● Students self- or peer-review a project. ● Students evaluate an algorithm presented as a flowchart/pseudocode that was created by themselves or someone else. ● Students evaluate an infographic that was created by themselves or someone else.
Creating Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	Questions that invite students to demonstrate how they are able to combine learned knowledge and skills to create or generate ideas for potential digital solutions.	Can you invent…? How could you invent…? How would you solve…? Can you recommend an alternative solution? Why do you think…? Can you construct a model of… ? Can you predict the outcome if… ? How would you create …? Show me a way to solve… Can you present to me your solution…?	● Students create a flowchart that represents an algorithm. ● Students navigate a robot to achieve a goal. ● Students modify a Scratch program to add a new element. ● Students design a sketch for a new digital device. ● Students create a graph/infographic that answers a particular question.