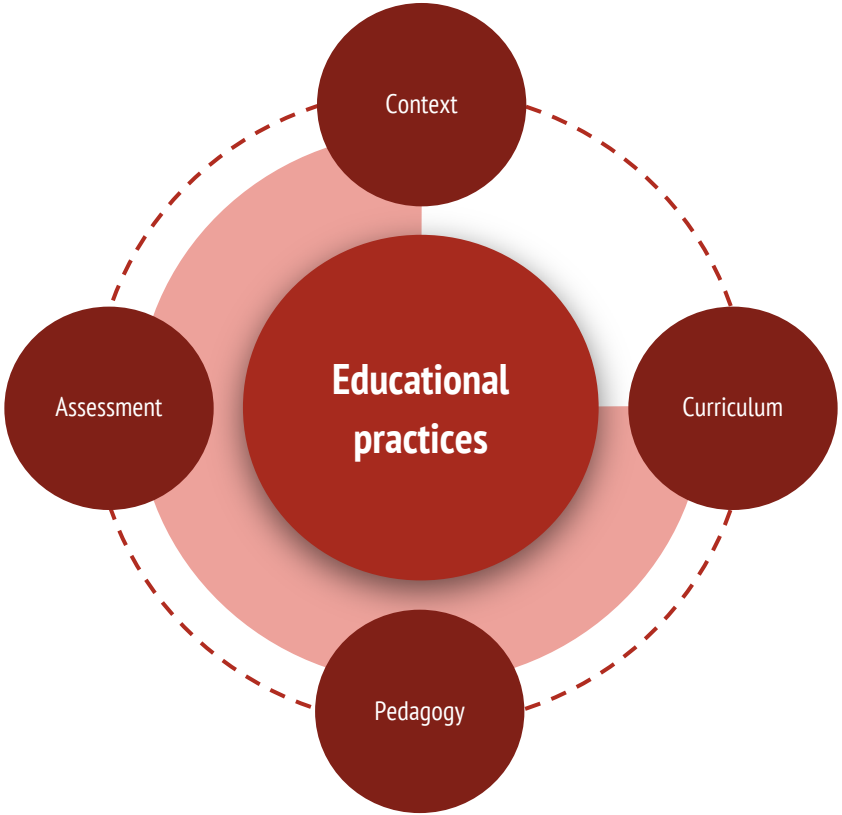
Faculty of **Education**
The University of Hong Kong
香 港 大 學 教 育 學 院

Developing and practising self-regulated learning through technology-rich learning tasks

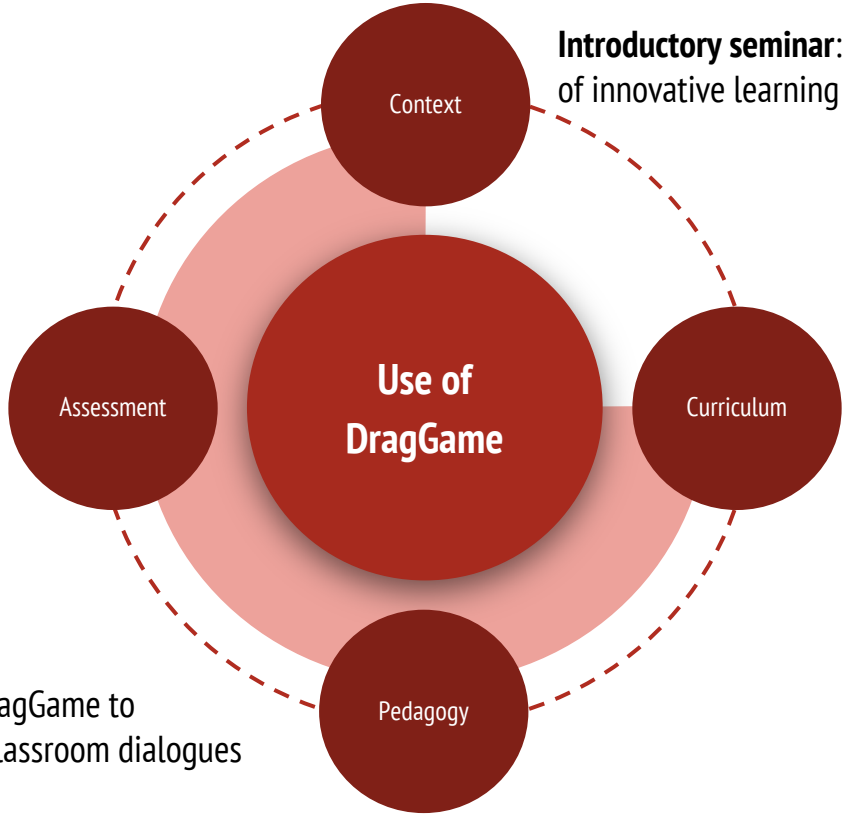
Promoting the Use of Educational Technology in Learning and Teaching in Science (S1-3)

Dr Anthony Cheng, Lecturer

Considering educational practices



In previous seminars of this project:



Introductory seminar: DragGame as a component of innovative learning environment

Teacher seminars 1 & 2: DragGame to strengthen student understanding on topics that are important for subsequent study

Teacher seminar 3: DragGame to stimulate productive classroom dialogues

Types of assessments

01	**Assessment of learning**	• Measuring learning outcomes after a formal course of learning
02	**Assessment for learning**	• Responding to assessment information to enhance the ongoing learning
03	**Assessment as learning**	• Connecting learning & assessment by students' self-regulation & assessments

Schellekens, L. H., Bok. H. G. J., de Jong, L. H., van der Schaaf, M. F., Kremer, W. D. J., & van der Vleuten, C. P. M. (2021). A scoping review on the notions of Assessment as Learning (AaL), Assessment for Learning (AfL), and Assessment of Learning (AoL), *Studies in Educational Evaluation*, *71*, Article 101094.

Self-regulated learning (SRL)

"Most contemporary theorists define SRL as a process – a coordinated set of actions and beliefs that are planned, implemented, and adapted as needed to accomplish or attain a goal… it is a process through which individuals approach and complete a learning activity, and then make judgments about how they need to improve in the future." (Cleary, 2018)

Cleary, T. (2018). *The Self-Regulated Learning Guide: Teaching Students to Think in the Language of Strategies.* Routledge.

Characteristics of SRL

- ➔ Students should be **actively engaged** in the learning process. They should set goals, monitor their cognitive processes and actions, and adjust these when needs arise themselves.
- ➔ Students might **make use of devices** (e.g. rubrics, checklists, lists of metacognitive prompts) to direct their own learning.
- ➔ The self-selected goals should **direct the learning behaviour** (actions taken related to learning).
- ➔ SRL requires suitable **personal and situational variables** (e.g. task goals, social goals, interest, amount of instructions) for student academic achievement.

Loyens, S., Magda, J., & Rikers, R. (2008). Self-Directed Learning in Problem-Based Learning and its Relationships with Self-Regulated Learning. *Educational Psychology Review, 20*(4), 411-427.

How DragGame corresponds to these characteristics

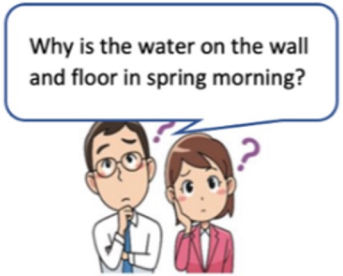
SRL characteristics

- ➔ Students should be **actively engaged** in the learning process.
- ➔ Students might **make use of devices** to direct their own learning.
- ➔ The self-selected goals should **direct the learning behaviour**.
- ➔ SRL requires suitable **personal and situational variables**.

DragGame characteristics

- ❖ DragGame requires students' **hand-on** involvement.
- ❖ Students are given **checklists** that indicate criteria of work.
- ❖ DragGame asks for hands-on that are **goal-directed**.
- ❖ Students are given time for both **individual work & group dialogues**.

Put it in context: Learning task



Can you try constructing a model for explaining the situation:
You may drag water particles (circles) into space.

1. Why do you arrange the water particles in this way?
2. Where does the water come from?

Water particles:

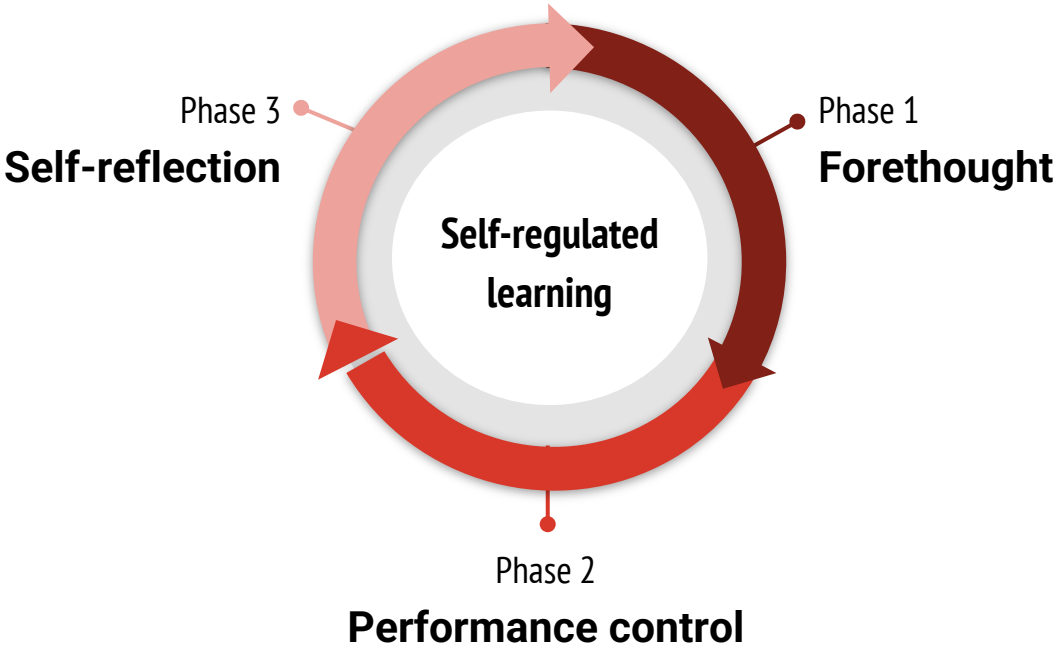
Directing goals

Support device creation

DragGame Hands-on

Iterations for individual & group work

Processes of SRL



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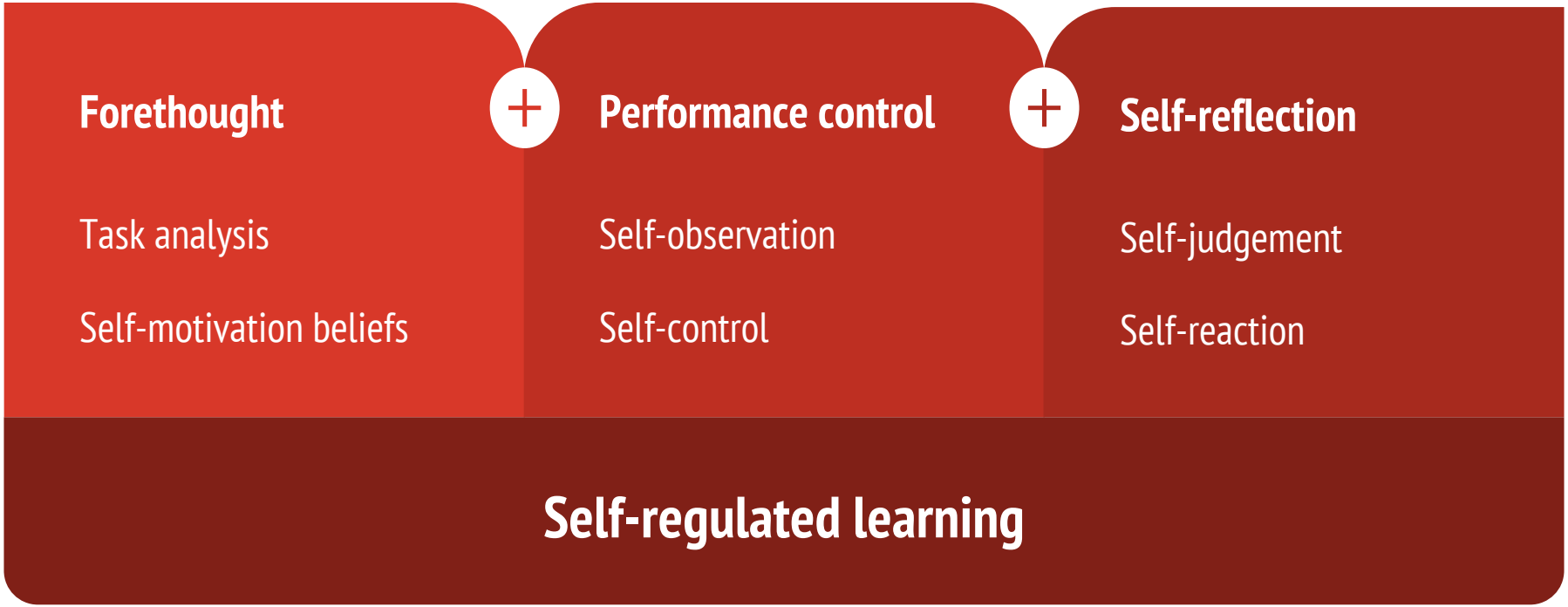
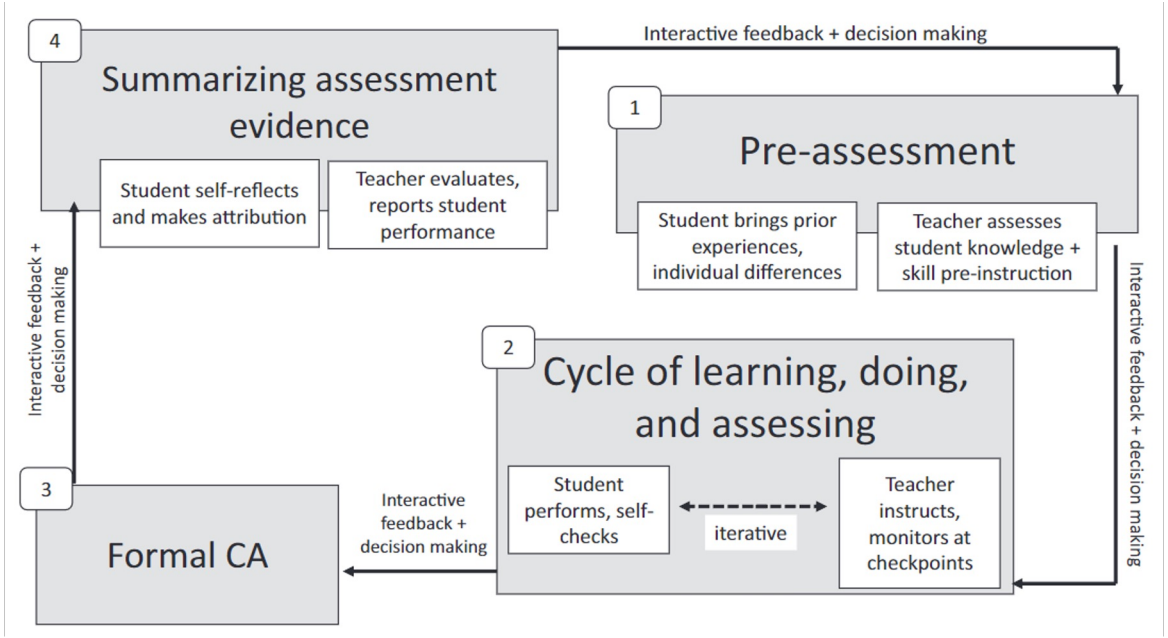
Specific sub-processes of SRL



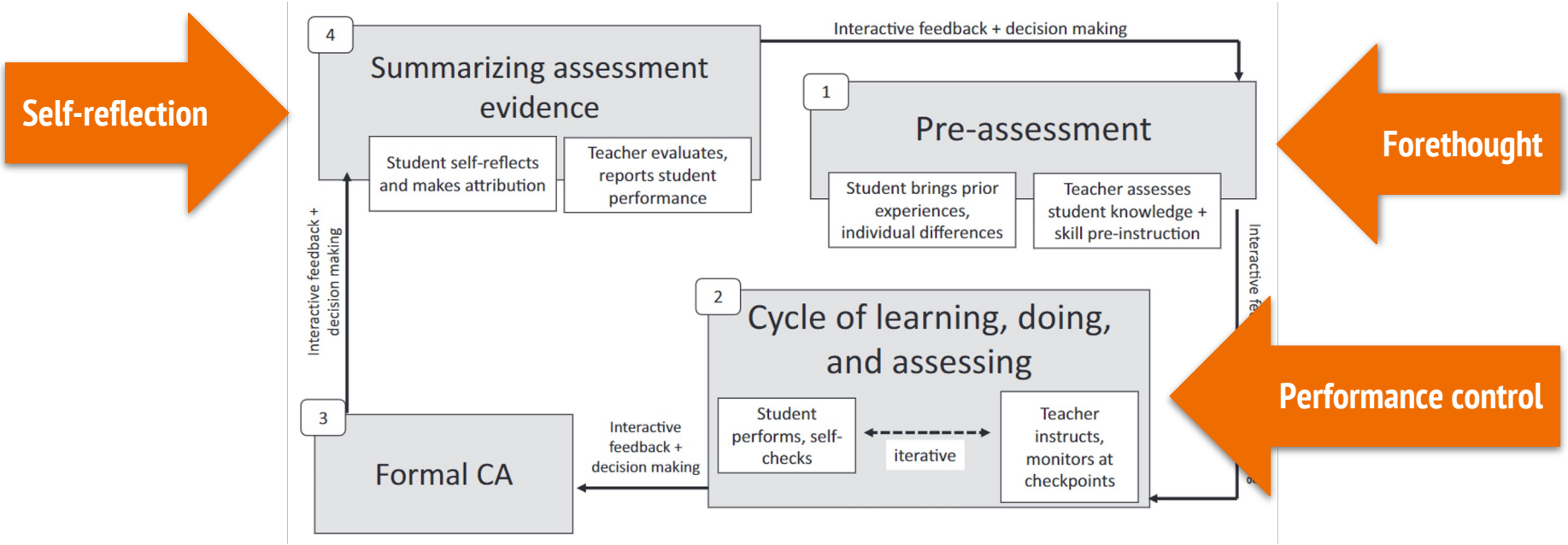
Cleary, T. (2018). *The Self-Regulated Learning Guide: Teaching Students to Think in the Language of Strategies.* Routledge.

Classroom Assessment: Self-regulated learning (CA:SRL) framework (Bonner and Chen, 2019, p. 8)



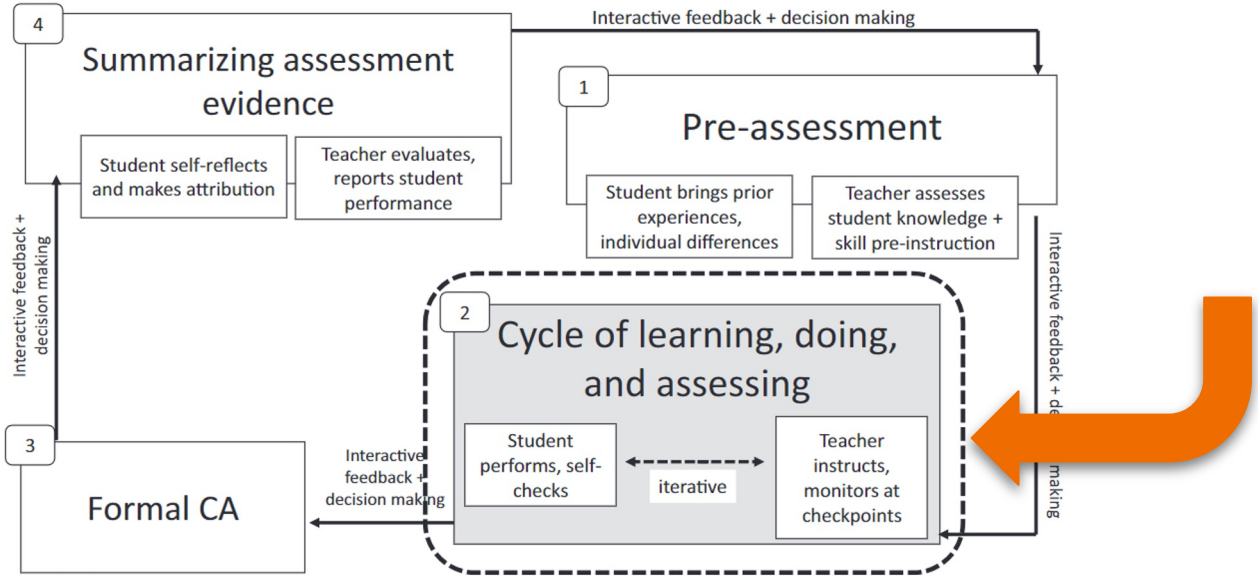
Bonner, S. M., & Chen, P. P. (2019). *Systematic classroom assessment : an approach for learning and self-regulation*. Routledge.

Mapping SRL processes on CA:SRL framework



Bonner, S. M., & Chen, P. P. (2019). *Systematic classroom assessment : an approach for learning and self-regulation*. Routledge.

When DragGame activities happen (Bonner and Chen, 2019, p. 38)



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Forethought phase: Self-motivation beliefs - Questionnaire

- ❏ Do you think the content to be learned in this unit interesting? Why?
- ❏ Do you think what you will learn in this unit is likely to be useful? Why?
- ❏ Do you think the you could learn this unit successfully?
- ❏ Do you think computer-based activities help your learning? Why?

Forethought phase: Task analysis (1) - Classroom dialogue

Ms. Chow: Good morning, class! Today, we're going to use the Draggame app to create a representation of water particles on a humid Spring morning. *Can anyone tell me the goal of this activity?*

Sophia: Is the goal to understand how water particles are distributed on a humid morning?

Ms. Chow: Yes, Sophia, that's part of it. Any other thoughts?

Michael: Are we also trying to learn how water condenses on surfaces like walls and floors?

Ms. Chow: Excellent, Michael! So, combining both ideas, our goal is to create a visual representation of water particles distribution and condensation on a humid Spring morning. Now, *can anyone tell me what we should start with?*

Forethought phase: Task analysis (2) - Classroom dialogue

Mina: We should start by opening the app and selecting the small circles that represent the water particles.

Ms. Chow: That's right, Mina! Now, *can someone explain how we should think about* the distribution of these particles on a humid Spring morning? Remember to think about the wall and floor where condensation occurs.

Ethan: We should think about where the particles are.

Ms. Chow: Good point, Ethan. Any other ideas?

Timmy: And how they are arranged at different locations, like the wall, the floor, and the air.

Ms. Chow: Excellent, Timmy! So, let's all open the Draggame app and start placing the small circles to represent the water particles. *Keep in mind what Ethan and Timmy have just mentioned.* Let's get started!

Performance control phase: Self-observation & control - Checklist development (1)

Ms. Chow: Alright, class. Now that you've had a chance to work with the Draggame app, let's take a moment to ***reflect on your initial engagement*** with it. Can anyone share their thoughts or experiences while using the app?

Sarah: I thought the app was really helpful in showing the arrangement of particles when water vapour condense. It was easier to show my understanding when I could show them visually.

David: I agree with Sarah. The app made it easier to understand the differences between the condensed water on the surfaces and the water vapour.

Ms. Chow: That's great, Sarah and David. It's good to hear that the app has been helpful. Does anyone have any suggestions for ***criteria we can use for self-monitoring***?

Performance control phase: Self-observation & control - Checklist development (2)

Emily: Maybe we could check whether the density of particles on the surfaces are different from the density of particles in the air.

Ms Chow: Good, we need to take care of where the particles are, and how many particles one can find in a given area of space.

Michael: I think it would also be helpful to have a list of questions we can ask ourselves after using the app, like "Can I describe how the particles are arranged in different stages?"

Ms. Chow: Excellent ideas, Emily and Michael. Class, please work in group to ***create a list of questions*** and ***asking yourself questions after using the app*** can help you evaluate whether your diagrams are satisfactory . We can also add further criteria as we continue working with the app. Please continue working on that in group.

Self-reflection phase: Self-judgement - Use of checklist

Have I considered…

- Water particles on the wall in terms of their…
  - Density?
  - Arrangement?
- Water particles on the floor in terms of their…
  - Density?
  - Arrangement?
- Water particles in the air in terms of their…
  - Density?
  - Arrangement?
- Whether all the particles are identical?

Self-reflection phase: Self-reaction - Questionnaire

- ❏ Which parts of the learning activities do you like most? Why?
- ❏ Which parts of the learning activities do you like least? Why?
- ❏ In which areas can you grow further? Why?
- ❏ What will you do further to help your knowledge & skill growth?

Concluding remarks

- Students' self-regulation skills and dispositions could be developed through engagement in educational visualisation app (e.g., DragGame).
- Computer-supported learning activities should allow students' self-regulated learning.
- CA:SRL framework (Bonner and Chen, 2019) highlights how different SRL processes could take place.
- DragGame together with classroom dialogues and other artefacts (e.g., worksheets) should help students to go through individual steps of the SRL cycle.