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)

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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

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<th>Assessment Description</th>
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<td>01</td>
<td>Measuring learning outcomes after a formal course of learning</td>
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<td>02</td>
<td>Responding to assessment information to enhance the ongoing learning</td>
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<td>03</td>
<td>Connecting learning &amp; assessment by students’ self-regulation &amp; assessments</td>
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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)

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.

### How DragGame corresponds to these characteristics

<table>
<thead>
<tr>
<th>SRL characteristics</th>
<th>DragGame characteristics</th>
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<tr>
<td>➔ Students should be <em>actively engaged</em> in the learning process.</td>
<td>✤ DragGame requires students’ <em>hand-on</em> involvement.</td>
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<td>➔ Students might <em>make use of devices</em> to direct their own learning.</td>
<td>✤ Students are given <em>checklists</em> that indicate criteria of work.</td>
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<td>➔ The self-selected goals should <em>direct the learning behaviour</em>.</td>
<td>✤ DragGame asks for hands-on that are <em>goal-directed</em>.</td>
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<td>➔ SRL requires suitable <em>personal and situational variables</em>.</td>
<td>✤ Students are given time for both individual work &amp; group dialogues.</td>
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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?

Why is the water on the wall and floor in spring morning?
Processes of SRL

Self-reflection

Forethought

Performance control

Specific sub-processes of SRL

- Forethought
  - Task analysis
  - Self-motivation beliefs

- Performance control
  - Self-observation
  - Self-control

- Self-reflection
  - Self-judgement
  - Self-reaction

Self-regulated learning

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

Mapping SRL processes on CA:SRL framework

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

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 you could learn this unit successfully?
- Do you think computer-based activities help your learning? Why?
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?
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!
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.