Reimagine, redesign and transform

Enhancing generation and exploration in creative problem finding processes in visual arts education

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APPENDIX A. LESSON STRUCTURE

Part 1.Intervention lesson for experimental condition - explicit metacognitive strategy instruction about divergent thinking

Lesson phases/ learning goals	Learning activities and metacognitive strategies	Instructional activities that lead to learning activity and metacognition	Rationale for enhanced monitoring and control processes
1: Activating prior knowledge.	**Reflecting, self-evaluating -** Reflecting on students' conceptions about creativity.Self-evaluating (mis)understandings about creativity.	Questioning: What do you know about creativity? Asking students about their concepts of creativity.	**Monitoring -** Enhancing learning and monitoring through clarifying knowledge and misunderstandings about creativity in general and about students' own creativity.
2: Linking motivational components to self-regulated learning; engaging students in solving real-world problems.	**Focusing, relating, understanding -** Focusing on main ideas, objectives and overall meaning of creativity in society and for students' own learning.	Whole-class discussion about examples of innovative art and design; interviewing students about their concepts of creativity and experiences with creativity.	**Monitoring -** Enhancing learning and monitoring through tying knowledge of the concept to the value of creativity;transforming this new knowledge into something personally meaningful.
3: Exemplifying divergent thinking as a strategy and when and how it should be used; formative assessment of understanding.	**Observing, analyzing, understanding, integrating, checking and reflecting -** Understanding through observing and analyzing examples. Summarizing and synthesizing new knowledge through reflective questions.	Direct instruction and whole-class discussion about declarative, procedural, conditional and contextual knowledge of creative processes and about divergent thinking as a strategy. Relating new knowledge to existing knowledge through reflective questions and checking understanding.	**Monitoring -** Enhancing learning and monitoring by transforming new and rather abstract and complex knowledge into visible and concrete models.
4: Applying knowledge. Collaborative use and student modeling of the strategy in action.	**Applying, modeling, analyzing -** Elaborating knowledge by applying. Exercising and creating own examples/experiences of the strategy in action.	Exercising with an alternative uses test - for a tablet computer. Student modeling of the strategy in action.	**Monitoring and control** - Creating meta-level model. Monitoring ongoing learning. Constructing a model of divergent thinking strategy to be learned.
5: Evaluating the originality of ideas generated.	**Evaluating, relating, analyzing, focusing -** Evaluating the originality of ideas generated**.** Focusing on the relevance of the main concepts and strategies.	Through whole-class discussion, students exchange ideas about the originality of the answers given to construct new concepts on divergent thinking; students compare and combine old and new concepts on creative generation strategies.	**Monitoring and control** - Selecting relevant control strategies. Interactive discussion and expert guidance provide examples of skilled monitoring, strategy evaluation and implementation of control processes.

6. Explicit instruction and description of divergent thinking as a strategy.	**Observing, structuring, reflecting, integrating -** Focusing on and highlighting key ideas; integrating concepts and themes and meta-level understanding through discussion.	Direct instruction; teacher modeling with whole-class discussion about knowledge on thinking strategies used in creative processes. Developing self-knowledge through reflection, about growth thinking and effects of 'feeling to improve'.	**Control -** Highlighting/accentuating by the teacher can assist students to focus on main ideas and construct meta-level models of divergent thinking as a strategy and of the benefits of creative self-efficacy.
7. Explicit instruction and description of 12 divergent thinking strategies (See Table 1), illustrating these with visual examples and teacher modeling of the strategy.	**Observing, analyzing, relating, reflecting, integrating -** Focusing on specific divergent thinking strategies; Integrating concepts and strategies. Promoting meta-level understanding by teacher modeling of strategies and dialogue.	Direct instruction; teacher modeling and whole-class discussion about four different divergent thinking strategies in a) association b) combination and c) abstraction. Relating these to examples of visual art and design and the concept of originality (decontextualisation / recontextualisation).	**Monitoring and control -** Creating meta-level model. Highlighting/ accentuating can assist students to focus on main ideas and constructing meta-level model of new strategies. Interactive discussion and expert guidance provide examples of skilled monitoring, strategy selection and implementation of control processes.
8. Independent use of the strategies.	**Applying, generating, reflecting -** Promoting meta-level understanding through application.	Students practise with an alternative uses test for divergent thinking. Students are asked to go beyond clichés and to produce original solutions for the uses..	**Monitoring and control -** Focusing on main ideas and constructing meta-level model. Integrated meta-level model facilitates selection of self-regulation strategies.
9. Integration of new knowledge into the learner's world.	**Analyzing, evaluating, integrating -** Relating information by evaluating, analyzing and discussing examples to help organize information.	Students receive feedback from their peers about the originality of their ideas and discuss the effectiveness of strategies used.	**Control -** Interactive discussion provides examples of monitoring, strategy selection and implementation of control processes.
10. Constructing higher order knowledge and integrating this knowledge.	**Relating, self-evaluating, structuring -** Construction of a meta-level mental model through feedback, teacher modeling and peer discussion.	Feedback and whole-class discussion and reflection on different divergent thinking strategies with examples related to the alternative uses test that students performed. The concept of originality in relation to divergent thinking strategies was re-introduced.	**Control -** A mental model serves as a basis to monitor and self-regulate ongoing control processes.
11. Creating knowledge through generating and predicting. Evaluating and integrating knowledge through reflection.	**Predicting, generating, creating, evaluating, reflecting, integrating -** Evaluating learning by generating new ideas related to the photography assignment.	Individually: predicting how divergent thinking strategies can result in original photographs. To stimulate self-evaluation of students' understanding. Students are asked to relate and evaluate two different examples of originality in photography to the knowledge and concepts about divergent thinking strategies.	**Monitoring -** Reflecting on mental model at meta-level; checking understanding, relating conclusions and performance outcomes to the model.

Part 2. Regular brainstorm lesson for comparison condition

Lesson phases/ learning goals	Learning activities	Instructional activities that lead to learning activity	Rationale for implicit monitoring and control processes
1: Activating prior knowledge.	**Exploring, envisioning, reflecting -** Exploring, envisioning and reflecting on the theme of 'Grasping Time' and students' questions about the theme of 'Grasping Time' and the assignments.	Questioning: Can you envision what you will be thinking the day after tomorrow, about what you were thinking and feeling at this very moment? In this way we are in fact 'mentally travelling through time'. The teacher showes examples of time as a concept, the visualizing of time in photography, through movement or light and shadow.	**Monitoring -** Implicitly stimulating monitoring through clarifying knowledge and misunderstandings about the theme of 'Grasping Time' and about the assignments.
2: Linking assignments of previous lessons to the theme of 'Grasping Time' and to all assignments and the time-schedule.	**Focusing, understanding -** Focusing on main ideas, objectives and overall meaning of time as a theme in art and science.	Questioning: Do you have questions so far about the theme of 'Grasping Time' and about the assignments you will have to do? Students respond with questions about both the theme and the assignments. Further explaining the theme. Whole-class discussion about examples of the theme of 'time' in visual arts and science.	**Monitoring -** Implicitly stimulating monitoring through tying knowledge of the concept of 'time' to the technique of photography and relating this to the assignment students had to perform: to make their own original visualization of 'time' in a photography series of three photographs.
3: Exemplifying how photography and visual arts could be used for transforming the - abstract notion - of time into an image.	**Observing, analyzing, understanding -** Understanding through observing and visually analyzing examples.	Direct instruction about declarative and procedural knowledge of time and various examples of the visualization of time in visual arts and photography. Original examples of the visualization of the abstract notion of time and the way it was used in for example 'sequences' of time or in 'evidence' of time (dust, traces - of light, marks, etc.).	**Monitoring -** Implicitly stimulating monitoring by transforming new and rather abstract knowledge of the concept of 'time' into visible and concrete examples from visual arts.
4: Evaluating the originality of students' own photography series.	**Analyzing, evaluating -** Analyzing and evaluating the originality of the photography series that students had already made.	Students analyze their own photography series, analyze their concepts of time and the way they visualize this. They evaluate the originality of their concepts and their photographs, and think of improved ideas for tjeir photography series.	**Control and monitoring** - Implicitly stimulating control and monitoring processes, by stimulating implementation of control processes.
5: Applying knowledge about photography and many ways to make photographs on the concept of 'time' (generation of new ideas).	**Applying, generating.** Exercising and creating own examples of photography and original ways to visualize the concept of time.	Exercising with 'brainstorming activities' related to students' own photography assignment. Students start brainstorming about their own individual photography series, they are going to realize in the next weeks. They exercise with an alternative uses brainstorm-test and are asked to generate as many, different kinds of original ideas for photographs to be made. Then they are stimulated to generate even more new ideas for concepts and photography-techniques.	**Control** - Stimulating self-regulation of ongoing control processes about making an original photography series.

6: Integration of new knowledge into the learner's world.	**Analyzing, understanding, integrating -** Evaluating, analyzing and discussing examples to help understanding information of this lesson about 'time' and visualization of this abstract theme into concrete and original photographic works.	Students receive feedback from their peers about the originality of their ideas and discuss the effectiveness of concepts and photography techniques used.	**Control -** Interactive discussion provides examples of monitoring, evaluation criteria and stimulates (implicitly) implementation of control processes.