REVIEW OF

Research on Creativity Training

SkillPlan

Canada

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The following reference document provides a brief review of academic research and relevant reports on best practices for teaching and assessing creativity skills. The purpose of this research was to support the development of the Skills for Success Practitioner Competency Framework and was part of a series of research reviews on best practices for teaching each of the Skills for Success. This summary provides an overview of evidence-based teaching methods in the area of creativity, key considerations when applying these practices, and a list of resources for further consideration.

METHODOLOGY

To conduct this review, several search queries were conducted on Google and Google Scholar using combinations of the following keywords: creativity, creative thinking, best practices, effectiveness, teaching, teaching approaches, teaching strategies, pedagogies, instruction, 21st century skills, 21st century competencies.

STATE OF THE LITERATURE

Creativity training has been a subject for systematic research since 1967, beginning primarily with training in the school system and then branching out to adult education.

The most comprehensive empirical studies done to date include: Torrance, 1972; Rose and Lin, 1984; and Scott et al., 2004.

Only one meta-analytical study has been completed specifically on adult learners. It included 11 studies from 1980 to 2012 (Tsai, 2013).

Many authors have noted a lack of empirical studies to be able to provide concrete research conclusions (Valgeirsdottir and Onarheim, 2017; Tsai, 2013).

Most recently, the OECD conducted a research project with the goal to develop a shared language on creativity and critical thinking across 11 countries in order to facilitate teaching, learning, and formative assessment within a given curriculum.

Conceptual rubrics were designed to clarify "what counts" or "what sub-skills should be developed" to guide the design of lesson plans and support discussions about those skills in the classroom (OECD, 2019).

CONCEPTS

The definition and integral constructs of *creativity skills*, as specified in the Skills for Success Framework (SRDC, 2021), are as follows:

DEFINITION:

"Creativity and innovation is your ability to imagine, develop, express, encourage, and apply ideas in ways that are novel, unexpected, or challenge existing methods and norms."

CONSTRUCTS:

- Use your imagination and curiosity

- Identify opportunities for you to innovate

- Generate ideas that are novel to yourself or others

- Develop your ideas
- Apply your ideas
- Facilitate a creative and innovative environment for yourself and others

APPROACHES TO TEACHING CREATIVITY

Cognitive Models

The literature broadly identifies six cognitive models associated with creativity training (based on Bull et al., 1995):

1. **cognitive models** – process models, e.g., problem solving, divergent thinking;
2. **social models** – manipulating students' socially and physical environments in order to stimulate creativity;
3. **personality models** – developing personality characteristics that are known to be related to creativity;
4. **motivational models** – focusing on end result motivations;
5. **confluence models** – supplemented cognitive models, systems approaches; and,
6. **other models** – e.g., attitudes, removing blocks to creative thinking.

According to the literature, cognitive models are consistently the most effective approaches to teaching creativity (Paul Torrance, 1972) (Rose and Lin, 1984) (Scott et al., 2004). Cognitive models (e.g., Osborn-Parnes Creative Problem Solving (CPS) model) are particularly effective in terms of influencing performance measures associated with divergent thinking and problem solving, but also in terms of the generation of creative products and attitudes and behavior (Scott et al., 2004).

The most frequently used and most successful model is the CPS model (Tsai, 2013).

Teaching Techniques

Teaching for creativity and critical thinking can encompass a wide range of instruction methods. It also requires a redefinition of roles, particularly, moving away from the notion that instruction should lead students' thinking towards a clear and pre-determined path (OECD, 2019).

Types of programs: Tsai (2013) classifies the different types of creativity training programs:

1. **Problem solving and decision making** (CPS, brainstorming, and Creative Decision Making) – use creativity to solve ambiguous problems. Four stages: identifying problems, generating solutions, evaluating solutions, and elaborating a solution.
2. **Ideation training** (including Synectics and Idea Fisher & Ideatree) – combining different and apparently irrelevant elements in order to create new ideas by means of analysis, substitute, rearrange, metaphor, and analogy.
3. **Visual/verbal stimulation** – incubation techniques by producing unexpected insights. It involves undedicated, inactive, relaxed, unconscious mental constructs through a series of visual or verbal stimulus.

Systematic learning techniques: Techniques where students are shown how to work with information in a systematic manner (such as critical thinking, convergent thinking, constraint identification, and use of analogies) were positively related to the success of training, whereas techniques with less concrete guidance (e.g., expressive activities, illumination, and imagery) were negatively associated (Scott et al., 2004).

Lectures: Lecture-based teaching was found to result in strong positive effects on divergent thinking. This suggests that demonstrating heuristics, or strategies may be sufficient to generate divergent thinking (Scott et al., 2004).

Motivating creativity: According to Torrance (1972), the most successful approaches incorporate the following features:

- Involve both cognitive and emotional functioning, provide adequate structure and motivation, and give opportunities for involvement, practice, and interaction with teachers and other children;

- Motivating and facilitating conditions make a difference, but differences seem to be greatest and most predictable when deliberate teaching is involved;

- Torrance (1927) identified a common theme in effective programs: cognitive and affective attributes that provide students opportunities to practice creative thinking.

Approaches to creativity training: Bull, Montgomery, and Baloche (1995) identified four general approaches to creativity training, which have now been widely used in later studies:

1. **Cognitive approaches** – systematic approaches to teaching the steps involved in the creative process;

2. **Personality approaches** – focusing on developing the personality factors involved in creativity;

3. **Motivational approaches** – using motivation to induce creativity; and

4. **Social interactional approaches** – ensuring the social and environmental climate is conducive to creativity.

Creative Problem-Solving technique: Puccio et al. (2006) examine the Creative Problem Solving (CPS) technique and summarize the research evidence that demonstrates the positive effects of CPS training.

- CPS is a model designed to capture the essence of the creative process.

- Creative thinking can be deliberately applied to resolve open-ended problems.

- Two basic characteristics that exist across all CPS approaches:

1. Multiple steps that capture the basic operations associated with the creative act – the need to define problems, generate ideas, transform ideas into solutions, and construct action plans.

2. A balance between divergent (i.e., generating a diverse set of alternatives) and convergent thinking (i.e., screening, selecting and evaluating alternatives) in every step of the process.

According to Davis (2006, as cited in Tsai, 2013), the CPS process is composed of three stages: understanding the problem, generating ideas, and implementing ideas. This can then be further broken down in to six steps that guide this process: mess finding, fact finding, and problem finding are the first stage; idea finding is the second phase; and solution finding and accepting the finding are the last step. Each of the stages involves two cycles: brainstorming to generate ideas for consideration and an evaluative phase to filter those possibilities.

Training Delivery

Scott et al. (2004,) provide the following **recommendations for delivering training on creativity**:

- Training should be based on a **sound and valid conception of the cognitive activities** underlying creative efforts (i.e., based on a conceptual model);

- Training should be **lengthy and relatively challenging** as well as involve discrete cognitive skills and associated heuristics;

- The teaching of principles or strategies should be demonstrated by **applying material based on "real-world" examples** (e.g., cooperative learning);

- Presentation of material in the teaching session should be followed by **exercises that are appropriate to the subject matter**. These exercises should be intended to provide students with practice in applying strategies and heuristics in a more complex, and more realistic context.

Delivery Categories: Valgeirsdottir & Onarheim (2017) identify four types of delivery categories:

1. **Traditional:** Training programs similar to what Scott et al. (2004, as cited in Valgeirsdottir & Onarheim, 2017) suggested as the optimal delivery form of creativity training, henceforth labeled "Traditional";

2. **Computer-based** programs whether in the form of software or an online format;

3. **Physical** programs that are facilitated with the main focus on physical exercises or other specific types of body engagement to increase creativity;

4. **Cognitive** due to their content and delivery being specifically aimed at improving creative cognition.

Effectiveness of interventions

In terms of training, Rose and Lin (1984) found that training had the greatest impact on verbal and figural originality scores.

The impact of creativity training has been strong for all types of students – young, old, students, working adults, etc. However, studies that were based on a predominantly male sample resulted in significantly larger effects than studies that were more based on a predominantly female sample (Scott et al., 2004).

Training processes linked to the generation of new skills, specifically problem finding, conceptual combination, and idea generation, proved to be the most effective (Scott et al., 2004).

ASSESSMENT OF CREATIVITY

Common types of Assessments: By far the most common assessment tools are those that are designed to assess divergent thinking such as Alternate Uses Test and the Torrance Test of Creative Thinking (Rose & Lin, 1984; Valgeirsdottir & Onarheim, 2017).

- The Torrance Test of Creative Thinking includes the following measures of creative performance (Rose & Lin, 1984):

  - **Fluency:** The ability to produce a large number of ideas with words or figures.

  - **Flexibility:** The ability to produce a variety of kinds of ideas, to shift from one approach to another, or to use a variety of strategies.

  - **Originality:** The ability to produce ideas away from the obvious, commonplace, banal, or established.

  - **Elaboration:** The ability to develop, embroider, embellish, carry out, or otherwise elaborate on ideas.

- Other types of assessments include (from Valgeirsdottir & Onarheim, 2017):

  - The Test of Creative Thinking—Drawing Production (TCT-DP, Jellen & Urban, 1989);

  - The Test of Creative Imagination (TCI, Karwowski, 2008);

  - Instances Task (IT, Wallach & Kogan, 1965);

  - The German Verbaler Kreativitätstest (VKT, Schoppe, 1975);

  - Self-reporting questionnaires and surveys.

Epstein Creative Competencies Inventory for Individuals (ECCI-I): Another empirically tested assessment tool was developed out of Epstein's (2012) Generational Theory, which assesses 4 competencies of creative expression:

1. **Capturing** – reserves new ideas as they occur, finds places and times where new ideas can be observed easily, and uses dreams and daydreams as sources of ideas;

2. **Challenging** – takes on difficult tasks, sets open-ended goals, manages fear and stress associated with failure effectively;

3. **Broadening** – seeks training, experience and knowledge outside current areas of expertise;

4. **Surrounding** – changes physical and social environments regularly and seeks out unusual stimuli or combinations of stimuli (Epstein's, 2012).

Scott et al. (2004) measured the success of training based on 4 types of performance outcomes:

- **divergent thinking** (e.g., fluency, flexibility, originality, elaboration);

- **problem solving** (e.g., production of original solution to novel problems);

- **performance** (e.g., generation of creative products);

- **attitudes and behavior** (e.g., reactions to creative ideas, creative efforts initiated).

CONSIDERATIONS

The multifaceted nature of creativity makes it difficult to produce generalizable research findings, and the distinct contexts, differing research subjects, and small sample sizes of the studies may influence their broader applicability.

Nevertheless, the research reviewed in this brief largely suggests that instructors approach the development of creativity through active and engaging teaching methods that mirror the complexities of real-world problems and situations. However, instructors may face challenges when developing compelling lesson plans due to the open-endedness of 'creativity', and benefit from a clear curriculum framework and exemplar lesson plans (OECD, 2019). Similarly, the instructors may encounter difficulties assessing creativity objectively and systematically. To counter these limitations, studies recommend approaches such as task-based performance tests and self-reporting measures.

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