

Table 3 *Nine Creative Principles in Six Disciplines*

Remark: The darker highlighted background represents the importance of the Creative Principle for the specific discipline.

Creative Principles in Disciplines	Music	Visual Arts	Architecture	Technology	Biology	Psychology
Contrast – Balance: difference equality equilibrium gradient	pitch, tempo, key <u>gradient</u> : glissando	brightness, different colors differentiation & grouping of objects	window, lighting, fire place separating versus connecting architectural elements, different floors	difference in energy, force, position energy, lighting ... signals in information technology	sensory organs physical cell parameters (membrane potential, proton gradient, turgor pressure) living organism as a flow system	droves, emotions <u>balance</u> : serenity, satisfaction, justice <u>gradient</u> : gradual learning
Demarcation: connect, combine – divide, split break	scale, overtone series	differentiation of objects, outlines <u>connect</u> : color, pattern	the building as protective shell with separating elements : roof, wall, floor, ceiling, façade heat or acoustic insulation connecting elements : door, window, corridor, ramp, stairs, escalator, elevator	connecting technologies : nailing, screwing, gluing, weaving, sewing, zipping composite materials separation technologies : sawing, cutting, splitting, punching, grinding, distilling vessels : traps, fishing gear	anabolic/catabolic metabolism, endosymbiosis connections between cells (plasma bridges, gap junctions) <u>division</u> : multicellular organism, cell & nucleolus membranes, cell differentiation, tissue, division of labor	communication, bonding emotions, cooperation division of labor, emotions of antipathy (hate, contempt, arrogance) breach of loyalty, fear of separation, social insulation <u>break</u> : rest, sleep

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Force: attract – repel motivate – demotivate	expression (forceful music passages), generating music	force diagram of dynamics (deformation) expression (grief, anger, power) psychological impact of colors, contrast, & shapes	structural engineering (structural construction, distribution of forces, payload, external influences), load capacity of the structural elements vertical connecting elements need forces for motion or transportation	tools, hunting equipment ropes, fire ... forces (gravitational force, electromagnetic force) engines: draft animal, water power, wind power, steam engine, internal combustion engine	muscles (striated muscles) osmotic pressure/turgor pressure proton motor force	motivation, drive, emotions to motivate action <u>attracting:</u> sympathy, affection, love, yearning <u>distracting:</u> aggression, antipathy, rejection
Directionality	unidirectional sequence of notes of a musical composition, omnidirectional spreading of sound	dynamics – the direction of force, orientation towards the goal (communication, foot traces) portrait vs panorama expression (sadness – hanging head, branches)	direction of a building along gravity, connecting element suggests the direction of motion, window as diodic connecting element	vessels, tools, hunting equipment (arrows, traps, fishing hooks), rope, conveyer belt, streams of water or wind, gas pipelines, light, engines <u>bidirectional:</u> rope, elevator, alternating current <u>omnidirectional:</u> thermal energy	bilateria, most organisms, unidirectional flow systems, membrane potential, unidirectional growth (in plant stem axis & roots) <u>bidirectional:</u> bidirectional replication, double stranded DNA, lipid molecules in the membrane	feedback, emotions <u>bidirectional:</u> relation/binding, dialogue, bilateral communication

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Repetition – Mistake copy, multiply	repeating notes, octaves, bar, rhythm, canon, fugue, rondo	pattern, hatching, similarity, repetitions in shape	modular building blocks (bricks), large functional buildings, floors, stairs, escalator, balustrade	engines (hoists, power engines, motors), tools (hammer, paddles), wheel, use of storage e.g. an accumulator	reproduction/replication, ingestion, rhythmic body functions, growth cycles	imitation, learning via repetition, trust based on regularly repeated rituals
Order: sequence, inversion	<u>sequence:</u> sequence of notes, scale, rhythm, permutation, rhythmic intertwining, without rhythm, inversion: Bach's inversions, crab canon, cross motif (Chiasmus)	light & color imply order, pattern allows continuation, estimation of object distance via object size & density of objects, sequential color spectrum	corridor & vertical connecting elements <u>sequence:</u> knitters, stairs <u>inversion:</u> escalator (one way), chiral spiral stair case	<u>sequence:</u> processes, series connection, <u>inversion:</u> vessel – boat, recoil principle, dynamo & motor, photovoltaics & LED, magnetic & electric poles	<u>sequence:</u> nucleotide sequence of DNA, protein sequence, evolution, serial arrangement of sarkomers <u>inversion:</u> double stranded DNA, lipid double layer, ATP-synthase as proton pump, eucariotic flagella move by bending, nucleotide pairs, reductive citric acid cycle, membrane inversion upon endobiosymbiosis <u>nematic:</u> smooth muscle <u>smectic:</u> skeletal muscle	<u>sequence:</u> action sequence, social ranking <u>inversion:</u> inversion of self-preservation (suicide), efferent & afferent

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Periodicity	harmony, harmonic series, rhythm, bar, beat, vibration, vibrato.	harmony of colors, colored light	ingestion & excretion, sleep, day & night, annual seasons, heating, escalator, spiral stair case, color & harmony	cutting, sawing, weaving, fabric manufacturing, paddling, rotary drive (power engine), charging a storage device, alternating current AC, light, water waves, zipper	ingestion, day & night rhythm, vegetation period, generation cycle, growth phases	droves have circadian rhythms, periodic regulation pattern of homeostasis for the satisfaction of life-sustaining needs, sleep-awake rhythm
Prepare, plan, forecast	written notes of a music piece, rhythm	dynamic impression by forecasting motion, optical illusion by misdirected forecasting, preparation of motion, pattern.	architectural construction plan, protective shell, fireplace/cooking food, kitchen, prefabricated building blocks (bricks, Prefab)	technical construction plans, operational plans, sales forecast, plans of machine processes	genetic DNA material, forecast of pray and predator behavior, hunting & defense strategies, planning of own motions to achieve ingestion	action plan, forecasting of psychologic reactions, emotions of expectation (fear, hope, trust, mistrust, disappointment, joy of exploration), relational emotions (care, grief), depression, borderline, manic
Storing – substitute preserve – correct	see below!					

Creative Principles in Disciplines	Music	Visual Arts	Architecture	Technology	Biology	Psychology
Storing – substitute preserve – correct	singing along by memory, written music, sound carrier , electronic data files <u>substitution:</u> Mozart’s principle of deletion, hidden extinctions	storing information, art to preserve culture	storage rooms, pantry for food, storage cellar with cooling function, attic for storage, energy storage, heat storage, fuel supply	materials storage: (jars, vessels, tanks, dams, material stocks & deposits) <u>energy storage:</u> potential energy (sledge hammer, dams, pendulum), kinetic energy (flywheel, pendulum, planets), deformation energy (metal spring, bow (& arrow), loop traps), expansion energy (steam pressure boiler, gun powder, fuel), electric energy (accumulators), electromagnetic energy (light), information storage (brain, documents, prints, electronic data)	preservation processes (self-preservation & reproduction), <u>material depots:</u> storage organs (roots, tubers, seed, stomach, spleen, liver, lung, kidneys, glands, blood cells, fat tissue) operative Storage (transmitter vesicles), <u>energy storage:</u> storage molecules (ATP, GTP), membrane potential, Information storage (genetic material, DNA) <u>mistake:</u> mutation <u>repair:</u> recovery, wound healing	<u>Information storage:</u> memory, conscience, superego, norms, rules preserve/conservation: serenity, trust empty storage: drainage (energy), dementia (erase/forgetting) <u>mistake:</u> embarrassment, exposure, shame, guilt <u>loss:</u> grief, longing, loneliness, grievance, boredom, distrust <u>repair/regeneration:</u> pause, sleep, regret