THE ALCHEMY OF ANIMATION:
A NEUROPLASTIC ART MEDIA OF COMMUNICATION AND TRANSFORMATION

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Abstract

On his blog Acting for Animators (2012) Ed Hooks considers actors and animators as shamans, because their goal in life is to help the tribe to survive by telling stories (2012). Animators as storytellers, connect and transform the modern urban tribes by bringing into life de Anima, the psyche; not just of the animated characters, but may be of their own creators and the audience who go to the cinema. We learn from movies as passive observers and by making movies, as active creators (work observed).

We present how making animation can transform our perspective and brain story tale-teller during the creative process of a motion picture. On this paper we will explain such alchemy of animation, applying neuroscience to animation in our teaching and art production. We will share the latest results based on the last 10 years of production with international students, between 18 and 40 years old, at The Animation workshop-VIA University College, Denmark. We provide them with knowledge of visual and emotional literacy, neuroscience and emotional intelligence to become more aware of their thoughts and emotions during the creative process of a movie. They gain a wider understanding of life by creating life. Each movie is a challenge where they have to reflect, identify emotions, and see how they can be triggered to evoke certain reactions to connect with the audience.

There is little literature regarding the neural effects of art production and its observation, especially in animation. The closest study is from Bolwerk A, Mack-Andrick J, Lang FR, Dorfler A, Maihofner C (2014) How Art Changes Your Brain: Differential Effects of Visual Art Production and Cognitive Art Evaluation on Functional Brain Connectivity; other useful studies such as Neurocinematics: The Neuroscience of Film (Uri Hasson. 2008); Flicker: your Brain in Movies (Jeffrey Zacks. 2015) or The Tell-Tale Brain (V.S. Ramachandran, 2012) support our studies and observations. Movies like Reason and Emotion (Walt Disney, 1943) and most recently Inside Out (Pixar, 2015) are great samples where animators use neuroscience to create the movie and raise awareness of our emotional life.

Animation is a valid media of communication, a powerful language of visual metaphors, which embodied emotions and feelings with our thinking, put into actions. By understanding how we create movies in our brains we enhance our communication skills, having the chance to reframe a situation for a better comprehension of our self and others. We gain self-control to regulate our emotions and different perspectives for problem solving.

The brain is the dream factory, the wizard of illusions and realities; our own home cinema. It is the creator of the mind. By making meaningful animated movies as we work the plasticity of our brains, we can transform our lifes. To make art productions which reflect the cultivation of a sensitive mind with a wise feeling, that may influence and inspire people to be more alive. Animation is the illusion of life (Frank Thomas, Olli Johnson, 1995), an expressive art form of communication, furthermore, a “Neuroplastic Art” media of transformation.

Keywords: Animation, creative learning, neuroplasticity, neuroeducation, emotional intelligence, life story.
1 INTRODUCTION. THE ALCHEMY OF ANIMATION.

From ancient times we have been learning through stories told by chiefs, shamans, teachers, healers, artists or leaders. All were aiming for the same: to pass knowledge and create tradition, history and cultural identities that could prevail; but over all, they wanted us to keep connected as communities for survival purposes [16]. Today science support that we are social animals who need to connect and be nourished, as Dr. Sarah Mckay says “having supportive friends, family and social connections helps you live longer, happier and healthier” [34]. But we are not completely objective; we are influenced by the environment and cultural background. We need a narrative to explain how we came to be and where we may be going. Reason why we construct life stories, narrative identities that provide our lives with a temporal sense of continuity. We are living stories [16]. Phycologist Dan McAdams (2015) researches how and why we build our story and identity based on what we learn and imagine during our lifespans. We create characters for each episode with high and low points, past memories mixed with future dreams; all united in an intrapersonal narrative to help us to move forward [36].

Current researches show that arts and science are coming together to study the impact of stories in our brains and maintain a healthy mind, especially from prevention, which is education. More scientists are paying attention into retrospection and techniques of mindfulness. Daniel Dennett [10] or Antonio Damasio focus on the philosophy of the mind and consciousness; neuroscientists as Daniel Siegel [36] has created the term and institution of “Mindsight” [27] to research how we perceive our self and others; Richard Davidson is pioneer opening the door to contemplative neuroscience [6] [9]; Uri Hasson research focus on the basis of communication, how our brains align when we tell a story [21]. The HeartMath Institute [22] claims to have developed efficient tools to help people to connect their mind and heart, improving coherence through breathing techniques. Animation Therapy in the UK [3] is probably the closest and pioneering in using animation applied to therapy; as the Animated Lab in Denmark [2] and the Film Board of Canada, use filmmaking to open discussions about different subjects. Movies are conflicts to resolve.

The most innovative results from neuroscience studying art production and cognitive art evaluation, reveal that visual art production leads to improved interaction, particularly between the frontal and posterior and temporal brain regions, therefore may become one excellent tool to prevent chronic diseases in elder people [5][23]. These results inspire us to ask scientists, artists and educators to work together hand to hand, to incorporate science in an attractive and effective way into people’s lifes. Schools should update their curricula and teachings methods where students of all ages, are invited to learn by playing, the curricula, as they are guided in their personal development. Education is not just memorized facts and subjects, its overall preparing and providing students with the necessary tools, and skills, to properly function and develop in life [30]. Animation is about bringing into life the anima, it can be a new tool for teaching any subject and help students in their personal growth. Animation is all about life [15].

The oral tradition of classical myths, fables, dreams or historical events are now more visual. Movies influence us [21] [42], therefore can guide us, from a pedagogic approach, to create a joyful and healthier life. If we could learn earlier in life more about the brain cognitive processes and emotions, we could comprehend better ourselves, how our mind and the tell-tale brain, re-creates stories and function [32]. We would be aware of the relationship between thinking, feeling and acting [26], and the possibility to change those connections. By acknowledging this, we have the chance to rewrite our story and rewire our brain, so transform our being [29]. In words of author and Dr.Linda Miles: “Motion causes emotion, but it's also about the power of association”, we can take the alchemy of animation as a new way to amplify the rewritten memories and understand the new chapters of our story life.

On the following sections we want to expose how we teach and apply such valuable knowledge from neuroscience through visual storytelling. Animation can be a media of communication where once we understand the mechanisms of perceiving and analyzing data with its relation to emotions; we have a tool to transform our mindset [5]. We can break old patterns and learn new ones to act with coherence and reach balance [23]. The mindful practice of noticing our thoughts is what increases our awareness of how we react based on past hurts and resentments. It decreases our stress levels, enables us to think more clearly, to consider the consequences, and to fathom and accept someone else’s point of view” [29]. Based on Linda Miles’ explanation, animation can be a mindfulness practice with some guidance.

Artists or not, teachers or scientists, we have an opportunity to explore the world of emotions and cognition through the creation of motion pictures. By playing other roles we learn about our self and life changes, by contemplating and creating life. Learning is growth and movement, which requires
courage, resilience and joy, in order to continue despite of problems [30]. “We all are what we have learned and more” (Moana. Walt Disney. 2016) from the legacy we inherited from our ancestors till the present and beyond, life is a self-discovery voyage.

2 METHODOLOGY. WHY ANIMATION AND NEUROEDUCATION

Our approach is holistic and from the animator’s eye (artist perception) [15]. We are not doctors but we support our observations and results on scientific studies which share our vision [5] [19] [20] [21].

We define animation as emotional energy in movement that our mind and body capture through our senses as a whole story, which is segmented in small pieces or memories [42]. Our brain is the responsible to assemble the puzzle and make sense, to find coherence and add a meaning based on each experience. The brain is the master key able to transform a story depending on how it connects the scenes, and under which perspective or direction creates the story [32].

We learn by observing, in our context within filmmaking, by watching movies and by doing, animating stories. Individual or collective memories, those, preserve our history and culture; the stories that affect our body and hearts at the same time that connect us [16].

Animated Learning Lab bases its methodology in “Neuroeducation”. Term coined by neuroscientist researcher Francisco Mora, who claims ‘the essential element to the learning process is emotion’ we learn what we love, for which we need new educational approaches to recover the joy and curiosity, primary factors for learning [30]. Ironically, as Sir Ken Robinson has been advising schools around the globe, we need a change of paradigm since they are killing creativity [33].

We introduce basic concepts of neuroscience and emotional intelligence, understanding how our brain perceives, re-creates and stores information for an optimal learning [38]. We connect the scientific knowledge to the creative process of animation through games. Students get to experiment with different animation techniques, learning the 12 principles of animation at the same time they learn about brain anatomy and emotions. They also watch movies to analyse and develop critical thinking [41].

Our goal is to show how we can reframe our story to recreate coherence and integrity, by using the neuroplasticity of our brain to restore balance and improve communication [26] [36] [37].

We will focus on the methodology currently practiced on the Erasmus Exchange semester “Creative Learning and Animation” at The Animation workshop, VIA University College [40]. There are two semesters of 5 months length respectively. Students are from different ages, ethnicities, professions, nationalities and sociocultural backgrounds. We have observed similar results in other international projects, based on curriculums which have been tailored integrating animation and creative learning [41] [18]. Some of these study cases have been developed in: Bolivia, Abuela Grillo (2009); United States, Heroes of life (2011); Africa, Afro Games (2013); Japan, Animators in Paradise (2016, 2017); Perú, Special World (2016, 2017) and EscuchArte (2015) among others in Europe.

2.1 The 3 Body Brains

We use several games (exercises) to show students the brain anatomy, the relationships between its different parts and how the brain connects them [9] [31].

We present animation as a visual thinking and feeling media of communication, where we can observe

![Figure 1. The 3 body brains. Inma Carpe](image-url)
ourselves from outside to transform the inside. For such an arduous task, at first, we need to know why and how our body-mind process information for an optimal understanding [20], to be able to express clearly a message and make decisions.

"Fig.1"Our vision and practice is inspired by The theory of Mind [11], the Triune Brain (McLean, 1960) [31] and what we coined our “3 Body Brains” (brain, heart and gut) structure, to explain the correlation between making a mental movie (use of science) and an animation (use of visual art). Concepts from cognitive neuroscience, emotional literacy, perception and visual literacy are part of the learning process through the 3 body brains tour. After this learning process, there is a final task to apply the knowledge acquired. This consists in the production of a movie based on a personal experience. A reflection upon the relationships between thoughts (brain), feelings (heart) and actions (gut) under the animator’s eye (personal perception) to create a story, a challenge.

2.1.1 The brain. How we think and create stories.

We are aware of the important role of perception and how the brain doesn’t distinguish between what is real or imaginary (Beau Lotto, 2015) [25]. Taking into account this fact and how our brain remains adaptable (what neuroscientists call plastic) [34], we go from observation to creation, using the plasticity of the brain on art productions. The Brain changes and modifies itself with each experience, and this works as long as we keep learning (Davidson, 2009). Daniel Siegel explains that “The activity of the brain creates “representations” of various types of information about the outer and inner worlds”. If we understand these mental representations as movies in our brains that we materialize in animation, we can reinforce the learning process from the creator view, going beyond the observer experience. Siegel studies support that “autobiographical narratives are reviewed to explore how the mind creates coherence within its own processes and how this central integrative function influences the nature of interpersonal relationships” [36]. This is very important for our self-regulation, since what we think came from what we feel and vice versa.

In animation we have to create the psyque of characters, asking why they act in that way, what their background is; any environment or imaginary world has to be believable to the audience, it has to be coherent and make sense as the real life. Art director Hans Bacher explains: “you are part of a creation process in which a dream world comes alive. It is scary and fascinating at the same time”. The big director of our internal story is the brain, the cortex within the Triune brain, but the mind is the awareness to create it and control it.

2.1.2 The Heart. How we feel emotions.

Emotions, regulated by neurological structures such as the Amygdala complex, the limbic system, Thalamus and hypothalamus, can strengthen synapses in memory structures like the Hippocampus by stimulating Noradrenaline’s secretion. When several environmental stimuli are being encoded in our brain, some contextual factors could trigger emotions that enhance this process (Sylwester, 1994) [38].

Therefore, if we implement emotions in learning processes, we could be able to enhance someone’s self-development. Animation does exactly that, acting as an emotional pill. Our “cognitive brain” is also our “emotional brain” [8].

We understand the heart as the valve that regulates the rhythm of our emotional “zenter”. We refer to this zenter, as the middle point that equilibrates our reason and emotion, the quiet spot between our brain and gut or intuition. We interpretate the heart as the embodied representation of the limbic system within the triune brain.

On this section we teach students the difference between an emotion and a feeling, how emotions affect our decision and interact with our thinking. Emotions connect us with an audience through empathy. We have to be able to create worlds where people feel identify with and connected. For this task we use the Atlas of Emotions from the pioneer on this field, Paul Ekman [4].

Other material as the movies as Reason and Emotion (Walt Disney, 1943) and Inside Out (Pixar, 2015) are used to debate how we create memories out of experiences, and the importance of talking about our feelings. Students understand through visual analysis of the films, the role of each emotion within our behaviour [12]. Inside Out is an excellent sample of how animation is able to connect abstract concepts from sciences with visual metaphors and deliver it in such a clear way, that the general audience understand it. Emotions are extremely important in animation and any artistic expression, we want an audience engaged with our work [19], make them feel what we want.
Furthermore expressing feelings through non-verbal communication as animation does, constitute an alternative language. It works very well with autistic children and patients with some impediment. This was the case of Owen Suskind (*Life, Animated*. R. Williams. 2016). Owen couldn’t speak due to his severe autism, he found in animated characters his way to communicate and express his feelings. Each character and animated clip represented his mood and emotional state. A clear sample of visual metaphors and creating meaning.

2.1.3 The Gut. How we Re-Act.

Cognition materializes in an interpersonal space. The emergence of complex behaviors requires the coordination of actions among individuals according to a shared set of rules. Such rules are learnt within our communities. It’s our choice and responsibility to decide how to act in accordance to our system of beliefs and mindset [18]. Usually dis-ease appears where there’s a dissonance between the alignment of the 3 body brains. It’s when our story lack of coherence and some part don’t make sense to our mind.

The mind establishes a sense of coherence by linking states of mind across time. By organizing the self across past, present, and future, the integrating mind creates a sense of coherence and continuity. Integration can be assessed by examining the structure of autobiographical narratives. Narrative coherence is reflected in the way a life story is told and the manner in which life is lived. (Siegel, 2014).

We refer to the gut as the location of our primitive reptilian brain in the Triune brain. Our intuition, or inner voice, that tells us when something feels wrong. The body speaks what the mind suppresses. Our collective memories are stories inherited, dorm within our genes. The emerging *Epigenetics* researches the changes in our genes expression, which some hypothesis stipulate can be affected by our thoughts, opening the door to the possibility of reprogramming our cells. Curious insight if we think how sometimes we talk internally and how important is to learn communication. Each person has the power to change his or her brain for the better—this is called *self-directed neuroplasticity* [35].

As communicators, we encourage students to be the director of their lifes and change when it’s needed. They understand their wellbeing will depend on which kind of stories and beliefs they chose to believe. Animation results very suitable media to imagine and recreate memories and dreams, for its power of abstraction and big variety of artistic techniques.

The mind, then, is that which holds the network together, often acting below our consciousness, linking and coordinating the major systems and their organs and cells in an intelligently orchestrated symphony of life. Kristine, C.Kane. 2013

To close this section we want to mention the relevant work of Gilua Enders, *Gut* (2015) [13]. Her insight view help us to understand how our bodies works, we are more than a mind attached to a body. Our way of thinking and feeling affect our body’s health. The placebo effect has a reason why exists. Animators have to study the mechanisms of the body, inside-out, to be able to express feelings and thoughts through the movement. The animator’s eye sees the invisible. In own words of Giulia, “The world is a much more interesting place if we look beyond what is visible to the naked eye- there is so much to see!” Let’s see the world with an open mind and heart, and invite students to explore it with the eyes of wonder.

2.2 NeuroAnimatics

“NeuroAnimatic” is a technique inspired, on one hand, by the term Neurocinematics coined by Professor Uri Hasson (2008) from his research on the neuroscience of film [21]; on the other hand, “Fig.2” it refers to the procedure in animation when a storyboard is animated.

![Figure 2. Storyboard for Neuroanimatic.](image)
This assignment has been developing into an experiment to work the neurolasticity, observe the impact of the artistic creation of a movie in our brain, and revaluate our perception. Its length depends on the framework and teacher, for better results the average is between one and two weeks. A Neuroanimatic is a visual representation focus on the attempt to align of our 3 body brains (correlated to the triune brain), in order to find the coherence thread of our story, our “Zenter” (our emotional middle point between reason an emotion). We identify the conflict, how it affects the author and how we can reframe the situation by studying different perspectives. The conclusion or end will depend on the free will of the author to choose what to change and how, with the right support.

Each one of us has the power to transform the negative into positive—we need only harness this power. You must pick up the pen and write the story of your life… or someone else will. Reframe your memories. By changing your story, you change your life. [29] we focus on the present visualization of what we perceive. It is an introspection which confronts the author with a dilemma to overcome. The goal is to gain wisdom about intrapersonal biology and apply emotional intelligence to develop a critical and creative thinking. The student will learn about his/her mindset and emotions to act mindfully in a near future. By rehearsing new possibilities, mentally and materializing them as a final product: the movie. [23] [24].

This task could work similarly to Stress Inoculation Therapy (SIT) described by Meichenbaum (Meichenbaum, 1977) which has been proven effective as a treatment for Post Traumatic Stress Disorder (PTSD) [28]. This technique consists in assess the moment when a traumatic event happened and the coping strategies that are being used by the patient to overcome the obstacle. Then, the patient, helped by the psychologist or therapist, sorts every possible behavior that could have been done to react properly to the situation. After the decision is made, they proceed to learn and rehearse adequate coping skills in order to prevent grief by acting as rehearsed in similar situations in the future. Another similar therapy where animation could be used is on the “neurally inspired behavioral therapy” proposed by the neuroscientist Richard Davidson [6], where a series of mental exercises are designed to alter the emotional trait that the patient wants change.

We guide the student during this creative process in an environment where he/she feels safe and relax. Usually the classroom is prepared to be a cozy space, what in Denmark is known as “hyggelig”. We introduce the assignment and ask students to be honest in their process, they are remindded to be respectful and listen to each other.

During the assignment we cover the fundaments of visual literacy, storytelling and animation, as tools to use during the creation of the film. Regarding to storytelling, students get familiar with Aristotle’s drama structure [1]. In the construction of stories, characters and spaces happen within a structure, with a beginning, middle and end or resolution to the problem that arises (plot). The mythical journey of the hero (Joseph Campbell, 1949) is based on Aristotle’s narrative, which in time has evolved into the “Story Spine” used in animation studios, like Pixar. “Fig. 3” It was created by Kenn Adams as a way of understanding dramatic structure.

![Figure 3. Story Spine. Designed by Joe Thompson.](image)

Aristotle defined the Greek word psyche with ánima or soul (De Anima, 1987) which is the principle of life or principle of animation. Subsequent studies have shown us that such a definition of psyche is more complex and goes beyond the anima, mind or consciousness [1]. The Greek philosopher
considered all forms of poetry modes of imitation or mimesis, animation is mimesis. It presents us with simulations of past or possible situations, where we feel safe to study hypotheses without fear of suffering the physical consequences of the possible mistakes. This facilitates a more relaxed state of learning. We interpret and embodied sensations and thoughts of other characters, living their dilemma through the catharsis of the story. In a way it is the most conceptual virtual reality that we can consider.

Tragedy is essentially an imitation not of persons but of action and life, of happiness and misery. All human happiness or misery takes the form of action; the end for which we live is a certain kind of activity, not a quality. Character gives us qualities, but it is in our actions—what we do—that we are happy or the reverse—a tragedy is impossible without action, but there may be one without Character. Aristotle's Poetics, 347-342 B.C.

“Fig.4” Emotional intelligence is applied in the classroom to understand how to work in teams. Values such as: listening to each other, nourish an open mind, open heart, learning to be assertive, compassionate, are always present during the creative process. The animated narration is an ideal pedagogic tool to face challenges (personal and external).

Emotions such as fear or pain may be experienced during the construction of an animated film where there is a strong personal connection. Nevertheless the final product of telling and sharing the story, acts as a catharsis where the individual feels better, released [39]. This is possible due to the activation of the reward system in the brain.
Within the creative process students research and analyze information to design characters and places, endowed with emotions that give meaning to acting in a specific manner. With such personalities they make us feel and believe what we are seeing and hearing. This occurs thanks to the synchronization of brains and empathy towards the narrator or what this is telling [19].
The true alchemy of animation is making the impossible believable and transform ideas and feelings.

“Movies can and do have tremendous influence in shaping young lives in the realm of entertainment towards the ideals and objectives of normal adulthood.” Walt Disney.

3 RESULTS
• Increased self-awareness of different mindsets and prejudices.
• Improvement in verbal and non-verbal communication.
• Acknowledge of resilience and tolerance towards other perspectives.
• Basic knowledge of emotions and self regulation.
• Knowledge acquisition of neuroscience and neuroplasticity.
• Better understanding of emotional intelligence and its application in daily life.
• Improvement in listening and empathy towards others.
• Set up of the fundaments of the principles of animation and visual literacy.
• Feeling of comfort in sharing and expressing the dilemma with others.
• Improvement of self-esteem and safety when speaking or expressing in front of an audience.
• Students connections enhance within the group dynamics.

4 CONCLUSIONS

Animation is a learning tool in social and emotional education. It’s an alternative means of teaching and a therapeutic tool for self-knowledge and personal growth.

This visual storytelling language is a communication bridge between arts and sciences where we invite educators, artists and scientists to explore the interrelations of these areas, and the possibilities to learn from each other and its reciprocate application. Platforms such Edutopia [17], are great communities to share new teaching methods and technologies.

Animation is an artistic form of great plasticity, rich in techniques that help us to see the world from different perspectives, from inside out and vice versa.
It can bring back the joy and curiosity for learning in the classrooms, working the creativity of students and teachers.

Animation could be considered a primary method of knowledge and language acquisition by its level of abstraction and visualization. It can constitute a tool within philosophy and psychology to deepen in the reflection and the origin of the “being”; Just as it can be used as a means to practice mindfulness due to its focus on attention, repetition and experiencing “the flow” [7].

Animation Therapy, couching or teaching with animation, facilitates the neuroplasticity in students’ brains.

To finalize, as artists and communicators, we can become more authentic and be more responsible of the visual content that we create.

Animation can make you feel more alive since you become a child again, ready to play and explore without fear, any role in the world. It opens the door of wondering, it’s the neuropsychiatric art media to communicate and transform you into anything you want.

It's really about an inner spiritual transformation that is taking place with the Beast and I saw it as a parable of my life that I got to express that. It was sincere. It was real for me. It was very real for the prince. I don't know that there ever is an illustration more clear as to what really can take place in a person's life spiritually than this animated character transforming from an animal to the prince. Glean Keane, 1991.

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