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This is the accepted version of a paper presented at *New Perspective in Science Education, Florence, March 22-23, 2018..*

Citation for the original published paper:

**Tobieson, U., Mutvei, A. (2018)**

**Aesthetic Expression Enhances and Deepens Teacher Students Understanding of Science Subject Matter**

**In: *New perspectives in science education: 7th edition: Florence, Italy, 22-23 March 2018* Libreriauniversitaria.it**

**International conference New perspectives in science education**

N.B. When citing this work, cite the original published paper.

Permanent link to this version:

<http://urn.kb.se/resolve?urn=urn:nbn:se:sh:diva-39683>



## Aesthetic Expression Enhances and Deepens Teacher Students Understanding of Science Subject Matter

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### Abstract

*Courses and modules within undergraduate programs should be developed and implemented in a way that the students experience deepens and contributes growth of knowledge. Therefore, as teachers we must create a variation of different learning possibilities in order to challenge, motivate and enhance the understanding of theories and abstract models in science and their impact on everyday life experience and conditions. Södertörn University has experience of combining aesthetic expression with science in pre-service teacher program for about fifteen years where we have seen the benefits of embodying abstract theories through art for a better understanding of science subject matter. The integration of science and aesthetic forms of expressions is supported by the Swedish curriculum both for preschool and compulsory school. We use an interdisciplinary knowledge based environmental teaching, basing part of the reflection process with a frame in phenomenology and art-based intermodal theory. Intermodal theory coined by professor emeritus Paolo Knill starts with amodal-perception. Perception as “the ability to see, hear, or become aware of something through the senses” while observation is described as “the action or process of closely observing or monitoring something or someone” were observe is to “notice or perceive (something) and register it as being significant” [1]. Thus, observation is a more complex action where it is necessary to interpret the gathering of what has been paid attention to by perceiving without judgment and putting it into a coherent context. Here we present integration of Aesthetic learning process with science subject matter in order to enhance and deepen students understanding. This was performed in a ten-week science course with a total of 54 pre-service preschool teacher students. We worked with and created two- and three-dimensional images and kinetic-aesthetic sculptures parting from phenomenon such as friction and gravity, the phases of Venus and the moon, different materials isolation and conductive qualities etc. Nearly two years after completed science-course the students answered a questionnaire demonstrated several perspectives of understanding.*

**Keywords:** *Aesthetic expression, integrating art with science, learning outcome;*

### 1. Introduction

The education of pre-service teachers involves visualization of their own unconscious tacit knowledge and experiences to be used in the teaching of science in preschool. It is also crucial to provide the students with tools and to develop knowledge in a manner resembling they way they later will teach children in preschool.

At Södertörn University the science teachers have worked together with artists in teacher education during the last 15 years with the purpose to create an education from a more diverse intercultural perspective. Disciplines of art such as dance, art, drama and music have been used, e.g., to visualize hydrogen bonds between water molecules by dancing, forces and balance in producing kinetic mobiles, details of biological material by drawing, drama exercises showing the pump of blood and digestion and singing songs about the cycle of water creating clouds and rain. In 2011 Södertörn University teacher education hired a group of artists in implement a more structured direction in what is now known as Aesthetic Learning Processes supported by the Swedish Curriculum.

### 2. Integrating aesthetic learning with science subject matter

Integration of aesthetic learning process and aesthetic expression was used when teaching science to students in a pre-service pre-school teacher program. This was done in order to enhance and deepen students understanding of phenomenon in science subject matter and to provide a range of tools for teaching. Two- and three-dimensional images and kinetic-aesthetic sculptures parting from phenomenon such as friction and gravity, the phases of Venus and the moon, different materials isolation and conductive qualities etc. were created during the course (fig. 1).

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We used an *Intermodal Arts model* consisting of a five-part psychokinetic imagery process looping and moving through the three levels of awareness and response whilst addressing the subject matter.



Figure 1. Closing of workshop with artefacts created by pre-service preschool teacher students spring 2016.

### 3. Aesthetic learning and expression

An aesthetic learning process based on an Intermodal Arts model within *Intermodal Theory* is a five-part process. The psychokinetic imagery model is used during and within every sequential step as the aesthetic learning and expression moves through the five-part work processes, looping, descending and ascending in-between and between the three levels of awareness and response, the *Mental level*, the *Emotional level* and the *Physical level* (fig. 2 and fig. 3) [2]. The three levels are equivalent significant components in the driving force behind this sometimes astute and exhaustive faculty that grasps, perceives, differentiates, distinguishes, integrates and conceptualizes the complexity of forms and patterns throughout and within the entire work process of aesthetic learning process (fig. 1) [2]. Crucial for the understanding of perception and sensitizing towards the emergent forms that appears as knowledge is being experienced, conceptualized and embodied is the idea and concept of amodal-perception [3]. Through amodal-perception infants perceive the world in a multi-sensorial way with all the modalities involved, transferring information from one sensorial modality to another. This is how an emotional tone asserts itself and appears in every particular experience and situation in relation to everything that impacts the understanding approach and experience of the world. Amodal-perception is a vital necessity conditioning life-experience and survival.

Dependent on its connection with imagination, any art discipline can evoke and find further expression in any other modality of imagination. Among all art disciplines we find a variety of sensory channels and imagination modalities. For example, within the visual arts the sensorimotor and tactile senses are engaged when we paint and a painting communicates not only through the visual image, but also through other imagination modalities. A painting may evoke a rhythm and a sound from which a story appears that depicts an act and a dance unfolds. In a similar way a poem can evoke sounds and movement [4]. To educate in an integrated way one therefore must allow a synthesis that sharpens the sensory modalities seeing that the human instinct is multisensory [3]. There then is a shift in awareness often experienced and described as a sharpened understanding and change in the notion of time and the conception of the learning process itself. This shift is often linked to a shared 'aha' – moment, response or experience. The phenomenon occurs whether the experience of *Beauty* is intensely joyful and pleasurable or is characterized by pain, confusion and perplexity [4]. This phenomenon occurs in Roland Barthes idea of *punctum*, the kind of meaning that arises and carries almost accidentally and hits the observer in a similar way to a wound. The contrary quality would not be the idea of ugliness but rather dullness and an apathetic inability to respond [5]. This state is often marked by a preconceived notion that very well may situate us in the narrow manner of thinking and acting that marks the helplessness around a 'dead-end' situation. The position may originate from both imaginary and/or actual external factors such as the number of students, the timetables, the



surroundings, social- and economic conditions, various disciplines and subject matter and the ability to reach the goals and quality of the curriculum.

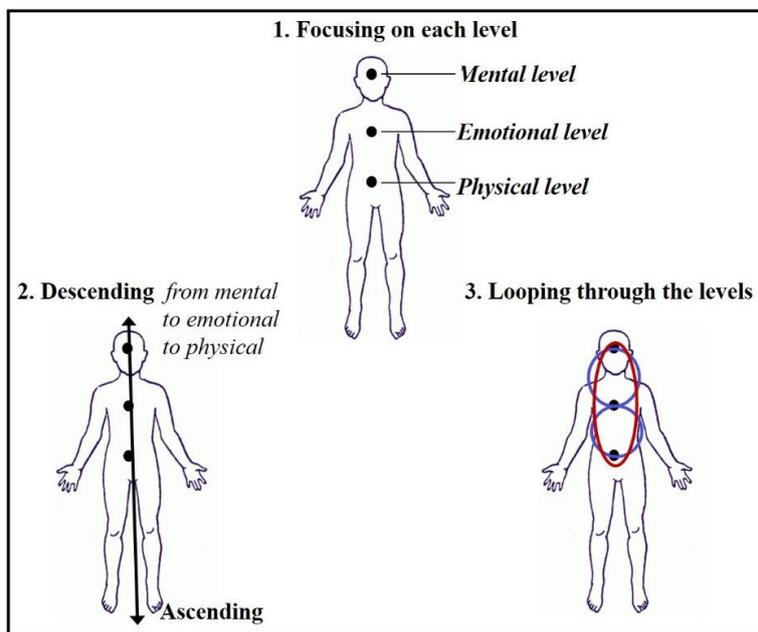


Figure 2. Three levels of awareness and response [2]

### 3.1 The five-part process of aesthetic learning

The work begins in **the first part (identification)** by introducing the theme in this particular case we recalled the content of the science course, the exercises they had carried out and done with examples like frictions from shoe soles on ice, insulation of a snow and the effect of gravity on a door hinge. They then created a world where night and day, planet system, seasons or the phases of moon all part of the course so far. We did this with memorizing in a narrative explanatory way at the same time as the auditory comprehension and two- dimensional visualizing skills were practiced using body and movement, time and space as a shaping of three- dimensional understanding (fig. 1).

In **the second part (confrontation)** is where the guiding and sensitizing toward the qualities and characteristics to the theme and/ or subject matter happens. This approximation is done in an organized, clear and distinct direction of discovery using corporeal expression as a medium on the path to a broader and deeper awareness and adding layer on layer. A good enough spatial room for movement of body, feelings and thoughts has to be established, *Range of play*. A mutual or written agreement of behavior and conduct has to be created as the foundation in order for *Range of play* to happen. (fig. 2).

The phase of **the third part (release)** cannot start until the *Range of play* is sufficient in scope, depth and balance. The phase of art making and play is ready to begin provided that an agreement has been reached regarding the materials, tools, oneself and the other participants. Then the art making takes place.

The step of **the fourth part (change)** it is crucial to recognize and create awareness of what has taken place during the process. Here is time to reflect over the content and how it has altered and changed throughout the process. (fig. 2).

In **the fifth part (growth)** is where the recollecting and reconnecting, evaluating, analyzing and reflecting over the outcome and its usefulness for learning and teaching takes place. An important and significant part of this phase is the openness and courage to question and challenge the relevance of the knowledge incorporated in relation to the requirements and the future roll as a teacher connecting back to the curriculum. [4].



<b>Psychokinetic imagery process</b> <b>A five-part process</b> Identification Confrontation Release Change Growth
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Figure 3. Intermodal arts model [2]

## 4. Results

One and a half year after the course, students were given an enquiry to answer anonymously. The questionnaire consisted of eight statements, where they had pick one of four answers rating from; totally agree to disagree. The other half of the questionnaire consisted of more open questions Out of the 54 students 46 students answered the questionnaire due to sabbaticals, illness or other reason for leaving the studies. Most of the students stated that they totally and largely agreed with most of the statements. Their answers showed and acknowledged an appreciation for the advantage of group activity, their own development of understanding and motivation as well as how to teach children in preschool.

### 4.1 Examples of comments from open questions

“Aesthetic learning has supported me and increased my understanding of different phenomena and concepts by talking around the concepts and summarizing at the end what each one of us came to understand”

“By giving two- and three-dimensional shape and form to phenomena and concepts, one has gained a deeper understanding of what they mean.”

“Aesthetic learning has supported and enhanced my understanding of different phenomena and concepts by expressing myself freely and learning in a more democratic way. It gives more understanding and learning.”

“What surprised me most is that I opened up and could relate science with body and emotion. In my future career as a teacher, I will use painting for reflection and creativity for increased work with goals from the curriculum in natural sciences.”

## 5. Summary

As Joseph Beuys argued, “Everyone is an artist” therefore we all strive for coherence, connection and the construction of meaning, direction and knowledge. Art making has the possibility to a multitude of perspectives, which alters into new knowledge [5].

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