

## Original Article

### Specificity of learning, skill development and baby swimming in Iceland.

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#### Abstract:

Individual development is considered, by Gottlieb in his theory 'Probabilistic epigenesis' to be the interaction between genes, neural activity, behavior and environment. The importance of stimuli and experience is central to Edelman's theory (Neuronal Group Selection Theory, NGST). Experience based selection create neural network in the brain. We suggest that Edelman's approach support the theory of specificity of learning. That is, you will be good at exactly what you train. You will not be good unless you train exactly the skills or abilities that you have received stimuli / training or experience in. The learning process indicate the development of skills from surface learning to deep learning through four phases. How much experience and training we already have gained, in relation to the skill we are learning, decides where we are in the learning process. In relation to skill development, it is possible to talk about quantitative and qualitative changes. Quantitative changes involve developing new skills (the focus is not on the quality of the skill). Qualitative changes involve being better on a skill. The four phases are understanding the skill; acquiring and refining the skill; automatization of the skill; generalisation of the skill. Learning principles indicates important aspects that determine how skills and knowledge are learned. The four learning principles are: Focused training; Challenges in relation to skills; Positive feedback and Self-monitoring. Research have indicated that baby swimming practice in Iceland may be important for child motor development and support the view of the specificity of learning.

**Keywords:** Children, development, neural Darwinism, task specificity, learning, baby swimming

#### Introduction

In this theoretical paper the focus will be on the following theme: Edelman's legacy (Edelman, 1987, 1992); the learning process (Sigmundsson & Haga, 2004; Sigmundsson et al. 2017); learning principles (Sigmundsson et al. 1998, 2017) and practices to promote development in infancy; namely baby swimming in Iceland (Sigmundsson & Hopkins, 2010, Sigmundsson et al., 2017).

#### Edelmans' legacy

Gerald Edelman received the Nobel Prize in 1984 for his research on the immune system. After receiving the price, he wanted to finish Darwin's theory of the brain. That is why his theory is often called 'Neural Darwinism' (Edelman, 1987, 1992). The theory is otherwise about selection that happens within the neural system during learning or when learning happens, whether it's motor skills or other knowledge related things. To explain what happens with learning, skill learning can be explained as we have created certain networks of brain cells by strengthen their connections through stimuli and experiences. A network of nerve cells (hangers) have made connection and work together. In the beginning, these connections are small and not so strong. But with more training and experience, they will get bigger and stronger. Then the question arises what hangers we want to create. We also have to decide which hangers we want to make stronger. This applies both to all school levels and in a work setting, we are dealing with (Sigmundsson et al. 2017a). When we are young, we have a lot of neurons and possible connections (gray matter of the brain) (Sowell et al. 2003). This means that at a young age we have an enormous potential to create many hangers that can then be developed through stimuli and training. One good example is the potential for language development. Edelman's theory has also shown an enormous specialization in learning. That is, you will be good at exactly what you train. You will not be good unless you train exactly the skills or abilities that you have received stimuli / training or experience in. For example, a teenager may be good at algebra, not geometry. Because he had not trained the geometry as much. So, this theory clearly shows us that what we train develops and strengthens. It's never too late to learn new things - start now.

#### The learning process

Figure 1 presents the learning process which comprise four phases. It builds on Henderson and Sugden (1992, p. 134-140) approach of the process that occurs in skill learning and acquisition. How much experience

and training we already have gained, in relation to the skill we are learning, decides where we are in the learning process. That is line with Edelman's theory (Edelman, 1987, 1992). In relation to skill development, it is possible to talk about quantitative and qualitative changes. Quantitative changes involve developing new skills (the focus is not on the quality of the skill). We could call it 'surface learning' or that the neural network is small. Qualitative changes involve being better on a skill, i.e. or deep learning. The neural network becoming larger and stronger. It is possible to argue that going from phase 1 to phase 4 that we increase the quality of the skill. That the individual should be able to generalize to new, different context, the skills have to be well learned and maintained (phase 4) (Henderson & Sugden, 2007, p 32).

## Skill Development

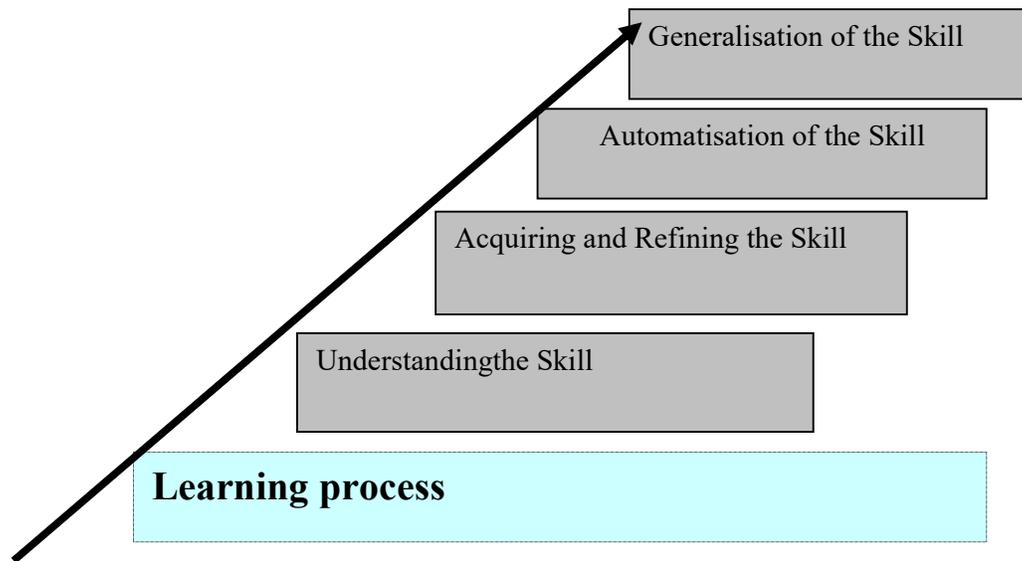


Figure 1 presents the learning process which comprise four phases. At what phase we are, depends partly on how much we have been practicing and experience we have

### Learning principle

Our theory from 2004 (Sigmundsson & Haga, 2004; Sigmundsson et al. 2017a) addresses general aspects that determine how skills and knowledge are learned. There are some basic general principles in all learning, which is about developing skills and increasing knowledge. There are four important factors:

1. *Focused training*: It is extremely important that the training is accompanied by a certain enthusiasm and that it is focused. That is to say, it is clear which theme / skill / area we want to improve (Ericsson & Pool, 2016; Sigmundsson, 2020). The training must also have a follow-up that is about monitoring the progress of the individuals involved in the training. Then the key question is how many hours the training has lasted. Magnus Carlsen, world champion in chess, had trained for 6,000 hours when he was 13 years old and it is believed that Wolfgang Amadeus Mozart had received many thousands of hours of training in the field of music at the age of six. As most people know, Mozart played both piano and violin when he was 4 years old, and that did not happen by itself (Ericsson et al. 1993; Ericsson & Pool, 2016; Sigmundsson, 2020; Sigmundsson et al. 2020).

2. *Challenges in relation to skills*: The psychologist Mihaly Csikszentmihalyi (1975, 2008) pointed out the importance of giving the right challenges based on skills (action capacity). Then the individual enters a flow that is positive for learning. Ericsson has, through decades of research, demonstrated the importance of challenges for learning (Ericsson & Pool, 2016). Therefore, the theoretical knowledge of the teacher / coach / mentor in what is being trained is key if he or she is to be able to find out what challenges each individual need. These principles are relevant in different basic skills in key disciplines such as literacy, math and science.

3. *Positive feedback*: Giving positive feedback is important for learning. It both helps to strengthen the network of neurons in use (dopamine strengthens the connection between neurons) and is part of a follow-up that is important. Where does the individual stand in what the goal is to improve. One can remember all one's life the positive reinforcement that certain teachers, coaches or others gave one. It helps to strengthen both self-esteem and growth mindset (Csikszentmihalyi, 1975).

4. *Self-monitoring*: That the individual feels that he can do certain things. This is in line with Edelman's theory of neural group selection. If, for example, an individual gets a math assignment that he solves, it plays a part in strengthening his inner motivation - 'I could do that'. The same goes for a person who has worked systematically to improve his putting in golf with many repetitions. When he sees that the training has worked, it

gives a positive reinforcement. What is important is to try to structure the lessons in such a way that these basic elements are considered. What basic elements can we take with us from neuroscience into learning psychology and teaching / training related to different skills and knowledge? Issues such as the importance of repetition, plasticity and specialization come into play (Sigmundsson & Haga, 2004; Haga et al. 2008; Sigmundsson et al. 2017a).

### **Babyswimming in Iceland**

One of the most important scholars in the field of child development is Esther Thelen, who published a book with her theory in 1994 (Thelen & Smith, 1994). The theory was given the name "Dynamical system approach". This theory is within what is called a probabilistic epigenesis, according to which the development of an individual is always an interplay between genetics and the environment (Gottlieb, 1998). So stimuli are key to development. Thelen's research has shown, among other things, the importance of coordination between the eyes and the hands (sense of position). This coordination is the basis for being able to use the hands for the various tasks (reaching and grasping) such as picking up toys and eating with a spoon and fork. Children with movement problems between the ages of 6 and 8 have problems with the relationship between eye and hand (Sigmundsson et al. 1997; Sigmundsson, 2003, 2005). That aspect has probably not developed properly in the first year. Scholars argue that poor coordination is one of the main causes of movement problems, of course in combination with lack of training. These children fall into a kind of vicious circle: Impaired coordination - impaired motor skills - less movement - lack of stimuli. About 35% of parents in Iceland take their children for baby swimming. Research have indicated that baby swimming, which includes 2 hours of training per week with children aged 3 to 7/8 months, can have a positive effect on children's motor skills in terms of fine motor skills (eye and hand coordination) and gross motor skills (balance). Hand control and balance are both factors that are better in children who have been in infant swimming than in a control group that did not participate in such training (Sigmundsson & Hopkins, 2010). It is said that infants start to stand up in a chair or table at the age of 9 months. Researchers have shown that with specialized training, where strength and balance are worked on, infants can stand in the teacher's palm for over 15 seconds at 4.3 months of age (Sigmundsson et al. 2017b).

Thus it can be said that early intervention works in practice. Researchers say that infant swimming can also have a positive effect on concentration, attention and focus. The children are watching and their senses (visual, auditory, olfactory, sense of touch, sense of position) and nervous system are under constant variety of stimuli during the time they are in the pool. Getting a variety of stimuli is extremely important for brain development at any age. The brain grows and becomes stronger with training and practice similar to muscle. The number of nerve connections increases with training (Edelman, 1987, 1992). After the first year, it is important to take your child to the pool regularly. Give it a chance to wade, play, frolic and after that start trying to swim. The time you spend with your child swimming is also important. We are then giving the child a variety of stimuli, important physical activity and comprehensive training of motor skills in water. In addition, the bond between the parent and the child is strengthened. Swimming provides an opportunity to talk and chat with the child without interruption from smartphones, tablets or social media.

### **Conclusion**

In this theoretical paper the focus has been on Edelman's theory on learning, the learning process, the learning principles and baby swimming in Iceland. The importance of stimuli and experience is fundamental to Edelman's theory (NGST) (Edelman, 1987; 1992) and the theory support the view of specificity of learning. The learning process indicate the four different phases the learning of skill goes through with training and experience from understanding the skill 'surface learning' to generalization of the skill or 'deep learning'. The four general learning principles indicates important aspects that determine how skills and knowledge are learned. Baby swimming practice in Iceland, with children in the age range 3 to 7/8 months, have shown to be important for child motor development and support the view of the specificity of learning or what is trained develops!

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