

A discussion of the necessity of craft education in the 21st century

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Craft education has held a permanent place in Estonian and Finnish schools, although its value and appreciation have changed over time. The aim of the article is to discuss the necessity of craft education in today's world and its possible impact on the development of adolescents. The discussion seeks a theoretical interdisciplinary explanation using three perspectives that complement each other. The first describes the challenges of modern society with respect to individual development and schooling. The second deals with Aaron Antonovsky's theory of generalized resistance resources and an individual's possibility to manage in a stressful society. The third addresses the individual as a developing neurological being, along with the effect of learning and practicing motor skills on the human brain. We conclude that craft is a multidisciplinary phenomenon, and that learning and practicing crafts promotes the comprehension of diversity and challenges in life. Additionally, educational craft enriches the learning environment, offering opportunities to develop transferable skills that human beings constantly need in society. In addition, craft provides a balanced way to come to understand the world and one's role in it, by simultaneously promoting motor and cognitive development and making unique demands on one's being.

Keywords: craft, craft education, making, sense of coherence, education, embodiment

Introduction

The fundamental purpose of an organism and a person is to survive through environmental interaction. This requires ongoing sensory-motor learning within a changing environment. Movements are not random. They are organized and purposeful.

(Koziol, Budding, & Chidekel 2012)

This citation from Koziol, Budding & Chidekel refers to the key idea of this article in which the aim is to contemplate the task of craft education today. We are looking for the qualities encompassed by craft-making as a systematic and natural form of environmental interaction fulfilling the basic function of being purposefully in the world. Our main question is, how essential is craft-making as a human activity and as a promoter of adolescents' growth in the 21st century? Current paper focuses on the sensitive age of the (pre)adolescence (10-16 year olds) and the developmental, social, and educational needs of that age. As we are researchers of Estonian and Finnish origin, we are looking at the social and educational matters from the viewpoint of those two countries. However, current research offers one possible frame of reference to educators in other countries where craft is taught as well.

In modern times, rapid changes in Western society have put schools under heavy pressure to follow, understand and answer the current and future needs of young people who are facing the unavoidable challenge of growing up. Schools are confronting several issues: an increasing or decreasing number of students but not enough resources to ensure the quality of education, the emergence of new media and open access to information, students from different backgrounds in one classroom, the rapid growth of knowledge in all domains, challenges to meta-cognitive skills, and the growing complexity of society (Tokoro & Steel

2003; O'Hara 2005; Linturi & Rubin 2011). Development towards a sustainable knowledge society means rapid constant change that conflicts with the traditional nature of school (Sarv 2008). Education is a mechanism for the reproduction of society as a cultural co-existence of people; this explains its natural conservatism (Ruus 2002). However, the question of what kind of knowledge or abilities students should acquire at school is a puzzle that remains unsolved (Lundgren 2002). All this has led institutional education to face unforeseen challenges that are causing frustration and emotional stress among students, teachers and parents (Tokoro & Steel 2003; Blomberg 2008; Kiilakoski 2012).

Education is therefore standing on the threshold of a new era where the question of how to keep up with social changes has to be considered. Educators are facing the issue of what to maintain and what to leave behind, and how to do the best possible work with the resources at hand to contribute to the overall development of young people so that they are willing and able to cope with life in the 21st century. However rapid the changes, scientific evidence show that there are universal ideas of education that simply need to be (re)discovered and implemented today. We agree with Eisner (2002), who states that the ultimate goal of education is to contribute to the disposition to persist in life-long learning and to enable individuals through the process of becoming the architects of their own education to continually reinvent themselves.

In Estonia and Finland, crafts has had a permanent position as a school subject (Lind 2009, Pöllänen 2009) although its appreciation and value have diminished. Further, the central objectives and tasks defining the meaning of the subject of crafts are in a state of change partly because of the above-mentioned situation in society and in schools, and partly because of the condition of the subject itself. Is the learning in craft education about practicing certain skills just to maintain craft's heritage, or to cope with everyday life? Is there a deeper significance of crafts that would enrich its meaning in adolescents' development in the context of compulsory education?

The current paper discusses the impact that crafts can have on the growth of adolescents in today's world at conceptual level. The discussion seeks theoretical explanations from three perspectives. These are derived from different scientific disciplines and are not necessarily inter-related, but from the point of view of craft they offer an interdisciplinary picture that is worth contemplating. First, the challenges of modern society as factors in education are described. This point of view seeks to illustrate the community and circumstances in which adolescents are growing up, and to indicate whether craft education could play a critical role. Second, we briefly introduce Aaron Antonovsky's theory of generalized resistance resources and sense of coherence, because this theory provides an explanation of how to cope with stressful circumstances. This perspective is examined against craft subject in order to find a common interface with it. Third, findings from neuroscience concerning the effect on the human brain of learning and practicing motor skills will be introduced. The aim is to elucidate the developmental impact that craft can have on the human organism. As a whole, these three perspectives complement each other. The first describes the demands of modern society on education, the second deals with individual's possibilities to advance in a stressful society, and the third addresses the individual as a developing neurological being.

Challenges faced in 21st century Western society

Our lives are constantly affected by the inherent phenomena of Western society. In the daily hustle, we may not notice or contemplate the big picture of the challenges we continuously face and cope with. Through education, one learns what one's place is in the world and how to behave and act (Ruus 2002). One of the goals of education is therefore to help children become capable of understanding and managing the nature and challenges of the society we are living in. When addressing this goal, one must keep in mind that the intricate characteristics of modern society are interconnected and expressed in a number of processes. In connection with the topic here, the following challenges of modern times will be discussed (cf. Hämäläinen 2009, 2013): the neoliberal view of the world, the increase in complexity and insecurity, the lack of norms, as well as consumerism, materialism and individualism.

According to Olssen and Peters (2005), neoliberalism can be seen as an economic discourse of philosophy which has become dominant in world economic relations. Neoliberalism's main objectives are to disengage government from the social and public domain followed by the privatization of these domains; to promote the free market (as a morally superior mechanism) as the best way to allot resources and opportunities; to limit the role of the state to the protection of individual rights; and to view the individual as a rational economically self-interested subject and the best judge of his own interests and needs (Olssen & Peters 2005; Bansel 2007; Nairn & Higgins 2007). Neoliberal rhetoric emphasizes terms such as *outputs*, *outcomes*, *accountability*, *purchase*, *specification*, etc., and is all about maximum efficiency, economic growth and success for those who make use of all possibilities offered by the market (Olssen & Peters 2005; Aava 2009). It is presumed that individuals are rational utility maximizers working hard to harness their own abilities and talents to achieve their goals (Olssen & Peters 2005; Nairn & Higgins 2007). The success or failure of an individual is measured in terms of the assets accumulated, especially the amount of money and the degree of consumption (Bansel 2007).

The scope of neoliberal discourse is not limited to the economy. Its spread into other fields has changed the way many aspects of life that used to be part of the social and public domains are now seen and discussed. An example is the emergence of the knowledge economy discourse that stresses knowledge as capital and demonstrates its relevance to labour market conditions and prospects (Olssen & Peters 2005). This trend represents a wider commodification of education, meaning that schools are actively selling themselves and competing with each other for students and limited government resources (Watkins 2007). Education is seen as the precondition to success – hard work and proper behaviour at school is the way to obtain a good job that can be converted straight into labour market power (Nairn & Higgins 2007), which in turn provides one with the necessary income to indulge in the freedom of consumption. Bansel (2007) finds that this consumption, fundamental to economic productivity, is seen as the prime economic and social activity in which people regularly engage. And the choices consumers make mediate not only what they might buy, but who they might become in the process. He adds that the neoliberal discourse sees people as rational profit-maximizing actors who are increasingly made fully responsible for their present and future financial security.

Hence, people are faced with making choices daily, and the number of options is growing. As Bauman (2000, 61) puts it: “There are more – painfully more – possibilities than any individual life, however long, adventurous and industrious, can attempt to explore, let alone to adopt.” This kind of choice overload makes it difficult to be satisfied with the decision made, as the question often remains whether it was the best one. And, there is no-one to blame if it was not (Schwartz 2004). The common expectation is that the necessity and meaningfulness of the choices should be determined by people themselves (Bansel 2007). Unfortunately, the instability of human desires can raise much uncertainty concerning what are our ‘real’ needs or what we ‘really’ want (Walker 2000). Bansel (2007) states that if one fails to choose, the result can be ambivalence, anxiety, fear, disappointment and a profound sense of deficiency. And yet, as Hämäläinen (2013) notes, the old mental frameworks and decision-making processes are often insufficient, and individuals more and more are suffering from life-management problems. Such all-embracing responsibility for the consequences of all of one's actions, decisions, successes and failures puts humans under heavy pressure causing the sense of insecurity.

The sense of insecurity in individuals is according to Hämäläinen (2009) illustrated by the following tendencies: the unpredictability of one's social development, the increasing complexity of society, and the fragmentation of moral norms. Rapid social and technological change is making our lives more complex and difficult to handle. As Larson (2002) finds, this increasing complexity is occurring both within and outside the adult occupational realm. He points out that middle-class grown-ups must manage various systems to function competently; among other things insurance, health care, legal systems, financial management, automobile maintenance, and so forth. The complex systems research approach emphasizes the uncertain and

emergent nature of social systems and phenomena in advanced societies (Hämäläinen 2013; Kurtz & Snowden 2003). Non-linear and self-organizing processes are characteristic of systems that are unbalanced, path-dependent and unpredictable. As Hämäläinen (2013, 5) notes, “micro-level behaviour at one analytical level can accumulate into macro-level consequences at higher systemic levels”. According to Kurtz and Snowden (2003), we are increasingly dealing with situations where obvious assumptions concerning order, rational choice or intentional capacity are no longer true and at the same time the tools and techniques we are using assume that they are. Hence, the increased uncertainty, complexity and pace of everyday life have created a “complexity gap” between external demands and the mental capacities of individuals (Hämäläinen 2013, 7).

To live in a world with plenty of choices and uncertainty, as stated by Walker (2000), people must rely on their habits of interpretation in order to make moral sense of the situations encountered. However, moral norms are nowadays in increasingly short supply. Walker (2000) finds that most of our moral lives transpire in small daily events and choices about how we interpret our experiences and the kind of interpretations we cultivate in and for ourselves. She adds that because we have freedom to construct our own reality in moral situations our actions are a result of previously constructed reality, and previously developed habits of moral understanding and interpretation. Finally, she states that “important questions about our moral life have to do with the habits of interpretation that we acquire and our efforts to override or change them” (2000, 154). The complexity of today’s surroundings and the abundance of choices would call for a safe environment where adolescents’ moral norms could gradually develop. However, youth in advanced societies now live in various kinds of family arrangements, often missing, unfortunately, adults to provide support, guidance and modelling (Larson et al. 2002).

The neoliberal discourse accompanied by other modern cultural tendencies such as consumerism and materialism is closely interrelated with individualism. On one hand, individualism has placed the individual at the centre of the framework of values, norms and beliefs (Eckersley 2002). Likewise, it has assigned to every human being his/her personal value, and has thus promoted democratic and collaborative activities (cf. social media) as well as allowing for fewer markers and barriers of status (Larson et al. 2002). On the other, however, as Eckersley (2002) finds that individualism used to be a celebration of human dignity and self-determination, but now it has become undermined into an ethic of self-centredness and self-gratification. The materialist, consumer way of life has made us judge relationships, experiences and objects according to their materialistic value. Somehow we have turned to buying any amount of products that are expected to make us feel good and worthy. Unfortunately, this kind of lifestyle has very little to offer in terms of satisfying social and psychological needs (Hämäläinen 2013).

Making one's way in society

As described above, the cognitive and psychological burden of everyday life has grown larger. According to Hämäläinen (2013, 7), the youth are particularly vulnerable in this situation with their limited life experience: “Problems with life management loom large behind many sad stories of young people who gradually accumulate various disadvantages and ultimately become socially excluded.” As our interest lies in educational craft, we cannot help but wonder whether it could be possible to help young people cope with this tiresome and constantly challenging society by dealing with these issues deliberately in the education system and particularly by engaging in craft-making? Is it possible to help young people gain deeper, more meaningful educational and life experiences that would offer more than just preparation for fitting the needs of the labour market?

The answer may be yes, because craft-making takes place within a manageable and controllable process of which the levels of demands can be raised (or lowered) according to the situation. Such manageable process

can counterbalance feelings of insecurity and promote understanding about complex environments. Making something always possesses an inherent order, which teaches the young craft-maker about the natural norms that emerge from the material and the process. By doing and making, the quality norms will also emerge as a heritage from the earlier generations of craft-makers. Hence, engagement in craft-making offers situations in which one can interpret and evaluate one's experiences of reality. Although craft-making is usually very individual, it can also be experienced in collaborations (cf. Ravetz, Kettle, Felcey 2013; Lahti 2009). In both cases, the maker creates her/his embodied relationship with individualism.

The craft process also produces a concrete experience that is an alternative to consumerism and materialism. Pöllänen's study (2013) shows that craft offers a tool to handle the demands of the wasting and throwaway culture. According to this study, people making craft are deliberately consuming less, they live family- and friendship-centred life, and enjoy personal fulfilment and development. Additionally, Pöllänen suggests that craft-making may promote sustainable development by helping individuals to appreciate the environmental consequences of their actions.

The environment we are encountering and interacting with daily is training us to see ourselves as mere tools for economic growth. By accepting this, we allow ourselves to be robbed of the chance to create our own subjective purposeful being. An antidote could be found in the deliberate exercise of meaningful craft-making that reasserts our environmental interaction (cf. the Koziol et al. phrase at the beginning of the paper) and helps us to understand the dynamics of society in relation to our own activity. Further, as long as our society continues to become more complex, and obey the economic diktats of neoliberalism, we must find ways to cope with it skilfully. Given this, how can craft education help adolescents to become competent individuals in today's circumstances? Aaron Antonovsky's salutogenic theory of generalized resistance resources and sense of coherence offers a possible framework in which to reflect on and see the potential effect of engaging in craft activities.

Developing resistance to the stressors of life

Aaron Antonovsky was an Israeli-American sociologist and academician whose work concerned the relationship between stress, health and well-being (Antonovsky 1979, 1988). He (1988, 180) expressed that there is reciprocal relationship between health and well-being; meaning that successful coping with life stressors has not only positive consequences for health but also for satisfaction, happiness, morale, and positive affect. Antonovsky attempted to answer why some people, regardless of major stressful events and severe hardships, are able to manage and remain healthy, while others are not (Eriksson & Lindström 2007). His proposition was that health should be seen as a health ease/dis-ease continuum (Antonovsky 1988, 3). His interest lay in the ways in which one can move toward the 'ease' end of the continuum and avoid moving towards the 'dis-ease' end.

Antonovsky found that chaos and stress are a part of life and natural conditions (Lindström & Eriksson 2006). He states that stressors (demands made by an organism's environment, coped with through a non-automatic energy-consuming action) are everywhere. The human organism responds to a stressor with a state of tension. The consequences of this state depend directly on the adequacy and efficiency of how the tension is managed. So, poor tension management leads to the stress syndrome, which, in turn, moves one toward the dis-ease end of the health continuum. Good tension management, on the contrary, pushes one toward the healthy end (Antonovsky 1979, 70).

Living in 21st century western society means being confronted with constant change and growing complexity for which there are no ready answers. This means never-ending learning and adaptation that can lead to stress, which then might cause ill health. Antonovsky (1979) sought to answer the following questions: 1) how do some people manage to stay well regardless of all the demands and tension experienced daily, and 2) what are the resources at our disposal that enable us avoid tension or resolve it, at least some of the time? He

came up with the term *generalized resistance resources* (GRRs). According to Antonovsky, GRRs are biological, material and psychosocial factors that provide one with sets of life experiences that can be characterized by 1) consistency, 2) participation in shaping outcomes, and 3) a more favourable underload-overload balance.

Consistency is seen as the experience of one's culture as clear and sensible. Participation in shaping outcomes creates a feeling of autonomy and competence. And, the underload-overload balance means that more complex work is more meaningful, but the complexity must not be overwhelming, and the resources available must make it reasonably possible to solve problems (Antonovsky 1979). GRRs necessarily provide all three experiences. According to Antonovsky (1979), typical GRRs are healthy behaviour, knowledge, coping strategies, social ties, money, cultural traditions, religion, self-esteem, commitment and even music. Importantly, the key factor is not what GRRs are available, but to *be able to use and re-use* the ones one has (Lindström & Eriksson 2005).

GRRs help a person to construct life experiences that promote a strong *sense of coherence* (SOC) – the second key concept in Antonovsky's theory (Lindström & Eriksson 2006). SOC is a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that life is comprehensible, manageable and meaningful. Comprehensibility (the cognitive component) means that life is seen as structured, predictable and explicable. Manageability (the instrumental or behavioural component) signifies that one has the resources to meet the demands of life. Meaningfulness (the motivational component) expresses the feeling that all of the demands and challenges that one faces are worth engaging and investing in (Antonovsky 1979, 1988; Lindström & Eriksson 2006). SOC means that one can perceive being able to cope with any situation regardless of whatever else is happening in life (Lindström & Eriksson 2006).

Antonovsky (1988, 138-139) stresses that a strong SOC is *not* a particular coping style: "What the person with a strong SOC does is to select the particular coping strategy (choose from the generalized and specific resistance resources at his or her disposal) that seems most appropriate to deal with the stressor being confronted." Mobilizing one's resources presupposes a strong sense of meaningfulness. As he continues, the "person with a strong SOC is more likely to feel a sense of engagement, of commitment, of willingness to cope with the stressor". People who have a high sense of coherence tend to have higher self-esteem, feel more in control of their lives, and possess a more optimistic outlook. Plus, they are more likely to respond to stressful situations with adaptive coping strategies, thus increasing the possibility of a positive outcome (Pallant & Lae 2002).

A strong SOC is promoted by the availability and use of GRRs. When it comes to adolescents, Antonovsky (1988, 177) emphasizes the importance of the social environment providing experiences critical to the emergence of a strong SOC. Therefore it is necessary to identify and assess the GRRs available to adolescents, to fortify existing ones, create new ones, and make them available for young people "to be aware of, identify [with] and benefit from" (Moksnes, Espnes & Lillefjell 2012). These kinds of cognitive and behavioural patterns that lead to effective coping with stressors are mouldable. Additionally, there is evidence of these abilities perhaps mitigating the unfavourable effects of stress in the lives of youth, and that adolescents can acquire these skills only from persons practicing them (Compas, Champion & Reeslund 2005; Geyer 1997). Geyer (1997, 1777) concludes that a high SOC can be expected in persons who "have learned to decide, who are used to doing it and who have opportunities to do so".

Our educational system still largely focuses on traditional "school intelligence" – mathematical and linguistic skills combined with the ability to sit still for hours and acquire knowledge from the teachers. This, however, might lead to a situation where schools exacerbate problems in society by not providing young people with the life experiences necessary for a high SOC (Nilsson & Lindström 1998). In the context of Antonovsky's

theory, Lundgren (2002) finds that schools should formulate education in such a way as to make students realize that they are continuously building an image of reality, and that reality cannot be made understandable only through facts. He adds that schools must also answer the question of how to make pupils' time at school more manageable and meaningful.

Engagement in crafts activities as a GRR

As mentioned above, GRRs are biological, material and psychosocial characteristics, phenomena or relationships that help people construct coherent life experiences. In his 1979 book, Antonovsky set forth five types of GRRs: artifactual-material (e.g. money, shelter, clothing, etc.), cognitive and emotional (e.g. knowledge, identity), valuative-attitudinal (e.g. coping strategies), interpersonal-relational (e.g. social ties, commitment), and macrosociocultural (e.g. culture, religion, magic). With some reservations, he adds a sixth, music (i.e. something that helps to create order in chaos). When first considering these five GRRs, we found that engagement in educational craft activities can promote the emergence of every one of them, but then we looked at the craft process as a whole and it occurred to us that we could add another resistance resource to Antonovsky's list: engagement in craft activities.

Making craft offers adolescents an experience of consistency, shaping outcomes, and balancing under- and overload. First, consistent experiences arise from the following characteristics of craft-making: creating something has logical steps, the materials and techniques carry certain rules, one is made familiar with one's cultural heritage and traditions, and one becomes involved in the designing of a product. Second, craft offers the possibility to shape the outcome through the design process, which, along with the actual object making, clearly relies on one's input. And third, when working on a craft project one can practice balancing under- and overload, for example by learning how to choose a project that is challenging enough and yet doable. If we see craft-making as a possible GRR, do we not then have, in an educational context, a tangible way to offer adolescents life experiences that could promote the development of a strong SOC?

By engaging in craft activities one can also experience a "small-scale" SOC, because craft-making incorporates all three components (comprehensibility, manageability and meaningfulness) of a strong sense of coherence (cf. Gauntlett 2011, 25). Notably, the comprehensibility aspect is ensured by the clear and predictable structure of craft: processes have a logical order that must be followed – certain steps need to be completed before others. Manageability is experienced when making a plan that one controls and manages while taking into account the availability of means and materials. In addition, meaningfulness can always be found in craft-making because, according to Metcalf (2000), craft embodies a human presence and sincerity against a background of anonymity, cynicism and irony. He continues: "Handwork symbolizes resistance against the culture of bigger, faster, and right away." A strong sense of meaningfulness is the precondition of one's capacity to mobilize resources in the face of stressful life events. Hence, the emergence of SOC's third component is one of the most valuable qualities of craft-making that one can experience.

Seeking evidence from neuroscience

A historically rooted division has existed between the mind and the body, as well as concerning the hierarchical ordering of mind over body (Gibbs 2005). According to Khan (2001), this separation of manual and mental labour has its origins in Aristotelian philosophy that sees labour as a prerequisite of virtuous leisure. The dichotomy between mind and body is still present in human thinking. The fact that people equate manual labour with a lack of skill (because of the correlation between manual labour and unskilled or semi-skilled workers) has led to deep-rooted prejudice against physical labour (Khan 2001). This might be why craft has in recent decades been fighting for its place in educational settings. However, findings from the field of neuroscience further justify craft-making, which could help educators see past the mind/body dichotomy and realize its value.

The field of neuroscience has blossomed in the last two decades and research has revolutionized knowledge about the developing brain, which formerly was estimated to be hard-wired by the end of the childhood (Payne 2010; Wan & Schlaug 2010). However, studies have shown remarkable transformations and shifts in the adolescent brain that are as striking as the changes that occur earlier in life (Colver & Longwell 2013). The adolescent brain develops dynamically, with some areas maturing faster and becoming more dominant until others draw even. Parts of the brain associated with more basic functions mature earlier: motor and sensory areas mature first, followed by areas involved in spatial orientation, language development and attention. Later to mature are areas involved in motor coordination and executive function (Gogtay et al. 2004). The latter is “the function an organism employs to act independently in its own best interest as a whole, at any point in time, for the purpose of survival” (Koziol, Budding & Chidekel 2012). These alterations require a longer period than puberty and should be considered to last until the late twenties (Shaw et al. 2008; Giedd et al. 1999, Lebel & Beaulieu 2011). In fact, the brain’s plasticity – in other words its capability to modify its structural and functional organization in response to changes in environmental input – has been proven to last throughout the lifespan (Wan & Schlaug 2010). However, different parts of the brain do not develop separately from each other; neither should the brain be seen as separate from the body and its environment (Sirois et. al 2008).

Recent studies have suggested that motor and cognitive development may be more fundamentally interconnected than has been formerly acknowledged (Koziol, Budding & Chidekel 2012; Kühn et al. 2012; Pangelinan et al. 2011; Tiemeier et al. 2010; Diamond 2000). For example, the cerebellum, the part of brain that has been associated mostly with motor control, has also proven to be active when performing cognitive tasks, such as word generation, sequence learning, tactile discrimination, and the maintenance of information in working memory (cf. Rosenbaum et al. 2001). Schmahmann (2004) states, that the cerebellum is not only a motor control device, but also an essential component of the brain mechanisms responsible for personality, mood and intelligence. According to Diamond (2000), most cognitive tasks that involve the pre-frontal cortex also involve the cerebellum. This is supported by Koziol, Budding & Chidekel (2012), who suggest that the cerebellum allows the brain to anticipate the outcome of sensory-motor behaviour, meaning that higher order thinking skills are an extension of the motor control system. They add that the cerebellum informs motor regions of the frontal lobes about the most efficient way to do something, and in a similar way it instructs the pre-frontal cortex how to manipulate ideas in problem solving.

It has generally been found that environmental factors such as enriched motor or cognitive experiences affect developmental plasticity across the lifespan (Kramer & Erikson 2007; Hillman, Erikson & Kramer 2008). Although changes in the brain’s structure and functioning that might be the result of learning or engagement particularly in craft activities have not been studied (Huotilainen 2013), it is possible to look at neuroscientific findings in areas that require learning skills similar to those needed in crafts. As an example, we can look at the effects of learning tasks that involve improving one’s (fine) motor skills using both hands. Motor skills usually refers to skills in which both the movement and outcome of an action are emphasized (Newell 1991), such as learning to play a musical instrument.

There is a widespread view that learning to play a musical instrument in childhood stimulates cognitive development and leads to the enhancement of skills in a variety of extra-musical areas (Bangerter & Heath 2004). This phenomenon commonly referred to as skill transfer, can be classified into two categories: “near transfer” and “far transfer”. The first occurs when there is a close resemblance between training and transfer domains (e.g. fine motor skills that develop while learning to play a musical instrument leading to better speed and accuracy in typing). In the “far transfer” category, the relationship between training and transfer domains is not so apparent (e.g. music training possibly enhancing geometrical representation skills) (Hyde et al. 2009; Wan & Schlaug 2010). For example, early dance education may positively transfer to such cognitive areas as the ability to selectively focus attention and resist interference from competing signals

(Petitto 2008). Further, another study indicates that the process of rehearsal, used in music and acting training, for example, implements a strategy for focusing attention that enhances memory, and that this skill transfers to other cognitive functions involving memory (Jonides 2008).

Research with both primates and humans has shown that learning and practicing motor skills can cause substantial alterations in different brain regions, such as inducing grey and white matter changes, thickening of the cortex and corpus callosum (the thick band of nerve fibres that divides the brain into left and right hemispheres), and the appearance of new active cortical fields (Kawashima 1994; Nudo et al. 1996; Karni et al. 1998; Anderson 2002; Dayan & Cohen 2011; Steele et al. 2013). Structural brain changes have been shown to be related to amount of training (cf. Steele et al. 2013). Further, learning to play an instrument can result in enduring changes in brain organization (Wan & Schlaug 2010), and it has been shown that 15 months of musical training in early childhood (5-7 years) already leads to structural brain changes induced by instrument practice and not a pre-existing biological predictor (Hyde et al. 2009). According to Huotilainen (2013), the learning of motor skills induces changes in the brain that speed up an individual's functioning and enable more varied reactions.

Eisner (2002) states that brains are biological but minds are cultural, and that there is no fine line between what is biological and what is cultural. According to Gibbs (2005, 10), the mind is "created from ideas that are closely related to brain representations of the body and the body's continued activities in the real world". The theories of embodied cognition see the human body as having a central role in shaping the mind (Wilson 2002; Gibbs 2005). Anderson (2003) explains that according to embodied cognition, intelligence lies less in the individual brain and more in the dynamic interaction of the brain with the wider world. He adds that human cognition is a highly embodied or situated activity, and that most real-world thinking occurs in distinct environments, is employed for very practical ends, and exploits the possibility of interacting with and manipulating external props. According to Barsalou (1999), a strong relationship exists between a person's perceptual experiences and her conceptual representations. In other words, the way in which we are embodied partly determines the kind of cognitive processes available to us (Cowart n.d.). Additionally, our conceptual ability, combining existing knowledge in new ways, transcends our experience (Barsalou 1999). Hence, learning new skills alters not just our physical brain but also our sense of self (Marchand 2008).

Marchand (2008) finds that skill acquisition is not '*unthinking imitation*'; rather, skilled practice expresses complex knowledge that should be valued as '*intelligent*'. Anderson (2003) supports this idea, stating that practical bodily activity can have cognitive and epistemic meaning, as it can be either a particular problem-solving routine or part of ongoing cognitive development through learning about objects and their significance in environmental interactions and manipulations.

"Hands are brains"

As well as in music, dance or physical education, in craft education adolescents are closely engaged in bodily activity. In crafts, one interacts with tools, makes objects, and by manipulating tools and materials creates a significant and meaningful connection to the environment. The brain is modified by craft activity. In this context, we could interpret the described neuroscientific findings in the following way. (a) Because the adolescent brain goes through large-scale changes, even minor craft activity may have a considerable impact on young individuals' development. (b) Learning craft skills activates motor and cognitive development, because they are closely interrelated, and (c) because learning new motor skills simultaneously promotes the learning of new cognitive skills. (d) Practicing crafts during the school years is important, because enriched motor or cognitive experiences affect developmental plasticity across the lifespan.

Eisner (2002) emphasizes educators' responsibility to ensure that educational environments help transform young people's capacities into abilities. Craft is never just a question of skill, or of being able to complete a

physical task. Instead, it is about the ability to understand and relate to the world in a new, more satisfying way. As well, craft is about the continuously expanding processes in which thinking and using one's body are meaningfully combined (cf. Stowe 2009). Another important quality of craft is its overall process, beginning with the conceiving of an object and its purpose, continuing with the design phase, and then making the idea real in the form of something concrete. The possibilities and restrictions set by the materials are continually taken into account in all stages. This again assumes *thinking and watching with the hands*, meaning that one has to touch and experience the material – perhaps even become one with it – to achieve the intended result. It is impossible to achieve what is planned by just thinking about or observing the material from a distance. In this regard, craft makes unique demands on one's being, and hence is different from music or dancing, for example. In agreement with Marchand (2008), who states that “immersion in challenging and creative work-based education establishes a pride in ‘making’ and unified sense of muscles, morals and mind”, we propose that craft, offering adolescents such experiences, is an essential and *irreplaceable* school subject.

Conclusions

Writing this article has been an interpretative journey to the sources of 21st century challenges, stressors and coping resources, along with neuroscientific understanding of human being as bodily and cognitively active. We have made interpretations from each above-mentioned discipline, and at the same time, curiously, have found those disciplines illustrating a combination of perspectives that can be reflected on in the light of craft. Perhaps this intention of combining small- and large-scale perspectives has arisen from our own experiences of designing and craft-making. Through craft, one can understand different spheres of life. It is not possible in one article to include fully comprehensive views about these disciplines; nevertheless, craft is a multidisciplinary phenomenon. Through it, one can comprehend the diversity of the challenges of life. In our opinion, craft-making can be a vital way of learning to understand and develop within that diversity.

Our large-scale starting point was to contemplate the challenges of modern society for the growing adolescents. We raised the following phenomenon to the discussion: the neoliberal view of the world, the increase in complexity and insecurity, the lack of norms, as well as consumerism, materialism and individualism. The description of these societal processes (affecting everyone, but especially adapting adolescents) show how important it is to “make one's way“ in this stressful „jungle“ and how an individual experience of managing craft process can be a prerequisite of managing larger interconnections of life. After this inspection of societal phenomenon we introduced Antonovsky's theory of generalized resistance resources and sense of coherence which gives a deeper understanding of individual's experiences of stress and coping. Antonovsky's theory and concepts were found useful in this article because from this theory it was rather easy to make connections and interpretations to crafts as a human resource. Plus, we've proposed to consider engagement in craft activities as one resistance resource when studying sense of coherence. The third perspective complements the first two and offers contemporary knowledge about neuroscience and brain research. So in the last section of this article we are trying to illustrate craft's possible necessity on the neural level. As stated before, craft activity can promote brain modification, promote both motor and cognitive development and thereof also influence the developmental plasticity across the lifespan.

As long as our civilization maintains institutional education, we are faced with the question of what kind of knowledge is worth teaching and learning in order to help the young manage the interaction between themselves and society. Garber (2002) and Pöllänen (2009) have earlier presented rationales of craft education from different points of view than in this article. Garber (2002, 142) even notes that knowledge gained through working with hands and the brain development connected to it, is the dimension of craft education that “should not be lost, and, moreover, that it should be further researched and appreciated in the hierarchies of what is valued as learning in schools”. This article aims to answer to this Garber's notion.

Adolescents need to be led to find their role in the world, but this must be done in a way that spares them from being beaten down by the complex nature of society along with its abundance of information and possible interpretations. By doing that, it is important to keep in mind that learning is promoted by combining a rich environment with complex and meaningful challenges (Green 1999).

Craft has several qualities that enrich the learning environment and this is why it is still a current and very important school subject. Educational craft carries many possibilities that should be made clear and then contemplated thoroughly by educators. We have shown here that craft offers possibilities to develop skills that human beings need in modern society. For example, craft-making supports the emergence of coping strategies that are useful later on and transferable to other areas of life. In addition, craft is a natural response to children's need to grow, offering a balanced way of getting to know the world and one's role in it by promoting motor and cognitive development. Additionally, craft-making makes unique demands on one's being, and therefore invites the young to create and recreate their subjectivity. Craft allows adolescents to experience the world through their hands and actions, to experience slowness, being in a process and enjoying it, "losing" oneself in the material, getting excited about design possibilities, and expressing oneself through making something (cf. Eggleston 2000).

Throughout human history, our hands have been the main part of our bodies that has explored and examined the environment. Through their creative explorations new tools and technologies have been invented. In other words, craft does not just offer the possibility to actively, physically create one's own knowledge and understanding of the world and of oneself, but also to recreate the world. Children work more with their hands in elementary school, but by the time they need the most diversified learning experiences and when these experiences would be most effective (the restless adolescent years, age 10 to 16), they are expected to "settle down" and be able to acquire knowledge of more theoretical subjects just by sitting, listening, reading and writing at their desks. How this actually affects their ability to learn and manage in later life is something educators should ask.

Movement and action are the prerequisites of thinking – necessary for experiencing one's body in different situations in order to gain ideas and knowledge. We agree with Marchand's (2008) statement that practical knowledge needs to earn the value and status it deserves, and "not just in terms of productivity and providing essential skills for the economy, but more importantly as a means to satisfying work and life". The global world is seriously challenging us, and particularly the future generations. Hence we must collectively look for ways to survive successfully. This paper is a beginning point for a study that approaches the questions concerning craft education by focusing on the craft teachers. Teachers are the ones whose daily work and direct contact with adolescents creates and carries the meaningfulness of craft education. We are interested in studying whether and how the matters discussed here emerge in craft teachers' experiences.

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