

BIRTHE LUND

2. THE IMPORTANCE OF IMAGINATION IN EDUCATIONAL CREATIVITY WHEN FOSTERING DEMOCRACY AND PARTICIPATION IN SOCIAL CHANGE

INTRODUCTION

This chapter investigates the connection between democracy and creativity and social change. The Swedish author of children's books, Astrid Lindgren, underpins the importance of imagination as part of social change: 'Everything great that ever happened in this world happened first in somebody's imagination' (Lindgren, 1987). Here she was echoing John Dewey, who portrays ideas as 'images-of-things-that-might-be' (Dewey, 1938/1976). But in order to transform and materialise an idea, human action is needed. It calls for reflection that draws on knowledge and experience in order to determine whether the 'might be' can be transformed into 'are'. This means that transformation processes include dialogue processes, interaction, and negotiation. To me, the essence of innovation is that, in contrast to creativity, the latter may appear through the idea or the vision itself.

This position also indicates that conceptualisation of innovation and creativity is a cultural conceptualisation. When creativity is personalised (e.g. as special talents or giftedness) it may influence students' personal interpretation of being creative, or not, and such self-cultivation may influence student's behaviour and agency in the long run.

In the Nordic countries it is the intention that all students experience equality through having their ideas and views taken into account; in addition to being educated with an aim of being able to take part in rational discussions, where major points of view are weighted according to evidence, rather than the position of the speaker as either student or teacher. This also implies welcoming students' ability to imagine what *they* want *their world* to look like (or to be) when being 'educated' in the broader meaning of the term. When I analysed the following actual and complex historical innovation and transformation process, the role of imagination as a 'connector' between pedagogy and innovation presented itself through studying the social and cultural dimensions of innovation and creativity—not as distinct and separate areas of studies, but in connection to each other.

The chapter consequently discusses why the ability to imagine and visualise the non-existing seems to be a powerful gift in students' self-cultivation process when aiming for engaged, responsible and active new members of society.

CONCEPTUALISING IMAGINATION

Although the educational philosopher John Dewey is first known for emphasising experience, defined as the result, the sign, and the reward of interaction between organism and environment; for Dewey imagination is, in itself, a vehicle of learning. Experience is a transformation of interaction into participation and communication, and the results might be art, as he describes in *Art as an Experience* (Dewey, 2005). Art is physically manifest in the 'expressive object' as the development of an 'experience'; the fundamental element is not the 'work of art'. Significant experiences and emotions are qualifications of a complex experience that moves and changes. He claims that all building up of experience take place through the image (Dewey, 1976). He likens imagery 'to the motor power of an idea'. Dewey hereby portrays ideas as images-of-things-that-might-be, which requires action in order to determine whether the 'might be' can be transformed into 'are' (Chambliss, 1991). So, imagination and sense are included in reasoning, and imagination is the embodiment of ideas in an emotionally charged sense.

Dewey reconciles reason with passion. Compared to a deductive and rational model of calculation, it is distinctive for Dewey's notion of practical reasoning that emotions play a constitutive role in conducting deliberation, because the imaginative exploration is imbued with feelings and other qualities (Dorstewitz, 2008). It has a projective dimension, as it incorporates both the ability to synthesise certain possible and anticipated outcomes, as well as the ability to produce a complex interpretation of a looming situation. The imaginative as well as the intuitive aspects of thinking then point towards the role of feelings and emotions as a bodily experience too. Nevertheless, the concrete image has an effect on the course of action taken and, in turn, it may be transformed by that very action. According to Dewey, imagining and taking action are not different kinds of experiences, but phases in a continuing stream of experience and it is a necessity for images to be formed in a social context, as imagination is influenced by existing images such as cultural symbols and signs.

When Einstein praises the value of imagination over that of knowledge, he is referring to his (bodily) feelings of being on the right track. To him, imagination becomes a vehicle of learning, by which he brings new realities into existence, even though science describes reality which is not only not present to the senses, but not perceptually available at all. Scientific thinking moves beyond the present information to the senses by referring to non-existing objects:

I believe intuition and inspiration [...] At times I feel certain I am right while not knowing the reason. When the eclipse of 1919 confirmed my intuition, I was not in the least surprised. In fact, I would have been astonished had it turned out otherwise. Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution. It is, strictly speaking, a real factor in scientific research. (Einstein, 1931/2009, p. 97)

Formation of images, emotions, and feelings that arise through our imaginative connection and engagement with the contexts help us to understand and make sense of ourselves and the world. Along this line, Dewey considers imagination to be a power in acting, at work to *bridge* 'the new, or hitherto foreign' element in poetry, art, or science. He treats imagination as a stage of knowledge and the images as the motor power of an idea. The power of imagination is then to realise what is not present, rather than making up anything which is unreal. We are not to choose between imagination and knowledge; rather, imagination is an important part of the knowledge creation process, of thinking.

From a psychological perspective, the imagining of an alternative to the present situation is crucial to the generation of emotions, as imagining a future alternative to the present one can create fear, hope, or anger, and let us become aware of things that are not present. In this way, imagination includes the past, present and future, it reflects memories and conceptualises thoughts on an individual level (Ben-Ze'ev, 2000). Consequently, emotions are an integrated part of the way we experience and make sense of ourselves.

To sum up: emotions influence our imagination and imagination allows us to be aware of what is not present—and it is creative potential, as recognised by both Einstein and Dewey. Imagination refers to the faculty for or the action of forming new ideas, images, or concepts of external objects not present to the senses, as shown in art and science, and daily life. Imagination then refers to the ability to show and demonstrate creativity, which is sometimes manifested in innovations and creative thoughts and ideas. In Figure 1 ~~below~~, I illustrate how knowledge creation includes imagination and creativity in both ongoing constructions and reconstructions as responses to the culture and social context.

This understanding indicates the socially embedded character of innovation and creativity, and the social and collective development of imagination as embedded in social structures and dynamics, point towards the cultural dimension of creativity development by symbols and images. From this conceptualisation follows that creativity development is not to be separated from knowledge creation in general, or from access to cultural symbols—education, which defines *educational creativity as a society embedded issue*, will be further developed in the following sections. The term educational creativity refers to and overlaps with the use of creativity for insight into problem-solving in other subject areas: creative ideas for teaching, teaching for children, and attempting to enhance their creativity (Smith & Smith, 2010). The first argues that creativity is an element of thinking, linked to problem-solving. The second element points to the educational system and the way we teach, and the last refers to general attempts to develop children's creativity. A century ago, when relating creativity to problem-solving and thinking (by including imagination), John Dewey integrated all these elements in his pedagogical and philosophical approach to education; forming a new pedagogy and innovating the dominating educational system, stating that (all) students are to be explorative, experimental, and reflective.

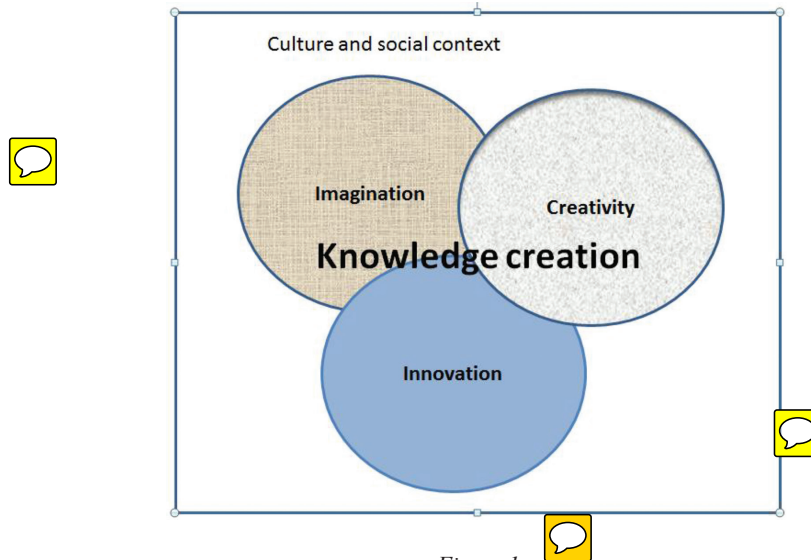


Figure 1

CONCEPTUALISING CREATIVE THINKING AND DEMOCRACY WITHIN EDUCATION

Today, educational creativity is a global political issue. It is being framed as essential 21st century skill¹ in the United States of America; in some ways echoing Dewey's pedagogical ideas from the 19th century. Twenty-first century skills are framed by Partnership P21, based on collaborative partnerships among education, business, community, and governments leaders:

Learning and innovation skills increasingly are being recognized as the skills that separate students who are prepared for increasingly complex life and work environments in the 21st century, and those who are not. A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future. (P21, Framework for 21st Century Learning, n.d.)

The P21 statement above indicates the risk of being left behind if students are not taught to be creative and collaborative. Along this line, in Europe, the EU Youth Strategy aims to support the development of creativity among young people and facilitate and support young people's talents and entrepreneurial skills. The Exceptionally talented students must be given opportunities for further development. This challenge to equality intentions is manifested by the fact that in Denmark it is prohibited by law to separate students based on skills and different abilities until grade 9 or 10. If creativity is defined exclusively as talent and personal giftedness, the cultural, social, and embedded aspect of creativity is missing, and this may in the long run influence students' agency and ideas of what democracy means and implies.

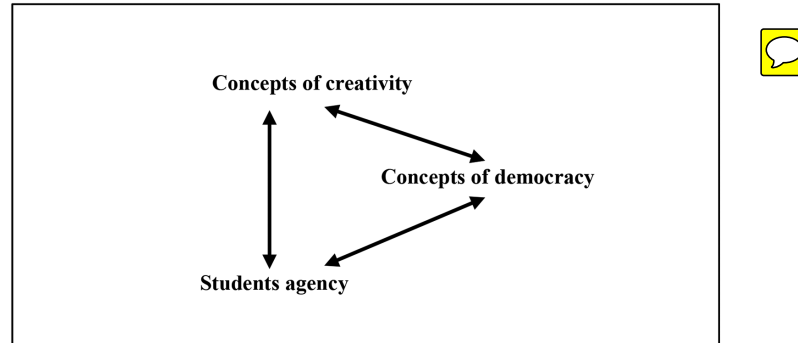


Figure 2

Figure 2 illustrates the interplay between concepts of creativity and concepts of democracy.

If students experience that some students are selected and given extra resources in order to develop their creativity based on grades, efforts towards enhancing creativity may challenge general equality efforts, such as the development of democratic values and norms in schools, explicitly expressed in the goals of the Danish national curriculum.

Education itself is conceptualised as a *human right* due to the historical *Bildung* tradition. The concept of *Bildung* is an educational category, dealing with normative aspects of teaching and learning. It encompasses the idea of education as a societal phenomenon which has human prosperity and development as its aims. This is reflected in the United Nation's goal to achieve free universal primary education for all, underpinned by the argument that education will enable a more fulfilling life: 'To embrace the broad range of life experiences and learning processes which enable children, individually and collectively, to develop their personalities, talents and abilities and to live a full and satisfying life within society'.²

Education is, furthermore, conceptualised as *capital*—it is regarded as a personal and/or national economic investment; reflecting students' productive capacity and competence evaluation. Development of creativity is valuable to societal growth as creative industries have a double impact on the economic system—they increase the gross of domestic product and create new jobs and value added. Creative industries may improve the evolution of economy, connected with social and institutional development (Martinaitytė & Kregždaitė, 2013). Education should be measured and compared from this perspective, with the level indicating the wealth of the country.³ Because social changes are reflected in education, education seems to be a battlefield for different political and economic interpretations of its role, resulting in continuous negotiations of what it actually means to be educated.

Consequently, education balances between being a *human right* and *human capital*. This enables different valuations of the need for education, the role of

B. LUND

creativity, and what is meant by the term 'education', related to being educated in a cultural and moral sense, which is often neglected within the innovations discourse of education (Lund, 2011, 2017).

A PEDAGOGICAL INNOVATION INITIATED BY LINDGREN'S PIPPI STORIES

Dewey's philosophy is in favour of a naturalistic approach that views knowledge as arising from an active adaptation of the human organism to its environment. In Dewey's philosophy and pragmatism, education is for life, it is about intellectual, moral, and emotional growth and the evolution of a democratic society. Today, education in science and technology are especially recognised as strong innovative forces, while the role of the arts and humanities tends to be neglected drivers; hence, I will point to development of new ideas within the field of pedagogy by part of departure in arts.

The Swedish author Astrid Lindgren created and expressed new images of children and children's position in society when she, in the 1940s, gave public voice to the perception of schooling from a child perspective. In the long run she paved the way for progressive pedagogical ideas in Sweden by reaching a broad audience. She reaches children through an aesthetic and emotional experience, as her books appeal to children's experiences and feelings of being subordinate to the dominance of adults. This understanding of childhood was new as well as very provocative, but over time it was accepted and approved, and gained political acceptance and support. As a result, Sweden became the first country in the world to legally prohibit physical punishment of children. In this way, Lindgren contributed to important *pedagogical* innovation and social change.

According to Rogers' innovation stage model, *Diffusion of Innovations*, this illustrates how art may contribute to innovation carried out through a process of social construction by an adoption of a new way of thinking. It is a theory that seeks to explain how, why, and at what rate new ideas and technology spread. Similarly, material inventions, as innovations, are embedded in culture and reflected by creations of new meanings on a collective level when forming a new attitude to a problem. In his book, *Diffusion of Innovations*, first published in 1962, Rogers argues that diffusion is the process by which an innovation is communicated over time among the participants in a social system. He documents the persuasion stage of an innovation—the decision process—often involves the ability to think hypothetically and counterfactually as well the ability to project into the future, as forward planning (Rogers, 1983, p. 174). This indicates to me the importance of imagination and the ability to be open, playful, and envision 'what might happen if we' in order to diffuse innovation.

The actual societal impact of an innovation may depend on who sees and formulates the need for concrete innovation, and how the expected consequences are framed through different discourses. In this way, innovation is embedded in communication and participation in social systems. When Astrid Lindgren created the imaginative figure Pippi, she also created a new (adventurous) social conceptualisation of what

it might mean to be a girl.⁴ Despite protests uttered by some, her work was admitted to the canon of children's literature in Sweden and Germany almost straight away. Later the 'diffusion' was enhanced by the filmed versions in the late 1960s and early 1970s, and hereby Lindgren's work gave children public access to new images of being a child, as well as new concepts of gender, democracy, and behaviour across the world. Besides questioning gender roles and equality, the figure Pippi questions what being educated means by playing an imaginative 'what if' game: what if children had more money, had avoided traditional upbringing, were living alone, and were stronger than most grown-up men? What would the world then look like? Pippi does not show any kind of inferiority or any sign of being inferior to any authorities (police, principals, etc). Despite being rich and the strongest girl in the world, she is non-violent and shares her wealth, based on the philosophy: 'When one is especially strong, one has a particular obligation to be kind to others'. Thus, the character Pippi constantly questions the given concepts of socialisation and what it means to be educated, as indicated in this dialogue:

(Teacher:) "Think how embarrassing it will be for you to be so ignorant. Imagine when you grow up and somebody asks you what the capital of Portugal is and you can't answer!" "Oh, I can answer all right", said Pippi. "I'll answer like this: 'If you are so bound and determined to find out what the capital of Portugal is, then, for goodness's sakes, write directly to Portugal and ask'". "For that matter, I've been in Lisbon with my papa", she added, still standing upside down, for she could talk that way too. (Lindgren, 1987, pp. 23–26)

She has the kind of imaginative creativity that allows her to devote a day to searching for a 'spink' together with Tommy and Annika, while searching for something which has no name yet and something they do not know. This shows important aspects of language and language games, of naming and expressing. As Michael Tholander concludes, based on his reading of this Pippi story: 'It [new words] allows you to transcend the limits that language appears to set before you, and to strive for something new, something adventurous, something joyful' (Tholander, 2016, p. 110).

Even today this adventurous figure will not adjust to any school systems. Viewed from the concept of PALS (Positive Behaviour in Learning and Interaction) she might be diagnosed as disruptive, disturbing, unprepared for learning, etc. Seen from the point of view of a progressive creativity discourse which values ingenuity and fantasy, she might be labelled curious, caring, innovative, socially responsible, etc. In that sense, Astrid Lindgren's novels and their characters clearly display the challenge to our school systems, by posing the question: do our school systems create enough space for the disruptive and adventurous students?

Along this line, education must, to some extent, welcome the new and the unknown and learn to deal with the unpredictable, as well as the unpredictable students. In the Pippi stories, she is representing the *newcomer*—the one who is introducing new ideas and information (Gert Biesta's (2013) use of this term, inspired by the term

B. LUND

Natality by the philosopher Hannah Arendt). Each birth represents a new beginning and the introduction of novelty in the world, by acting:

The new beginning inherent in birth can make itself felt in the world only because the newcomer possesses the capacity of beginning something anew, that is, of acting. (Arendt, 1958, p. 9)

Arendt claims individual's show 'who' they are and reveal their unique identities through action and speech. In the Pippi novels, the transcendence appears through the creation of a new language, the creation of new images of being a child, and of children's civil rights. In this sense, the progressive pedagogical ethos of the novels by Astrid Lindgren is almost a reflection of the essence of Dewey's insistence on pupils' rights within education. His ideas of being educated are later reflected in Pippi's ideas, as he values the importance of 'keeping one's soul', being allowed to be authentic, curious, and gain the ability to learn and value own meanings and experiences over barren discipline information (Dewey, 1938). *Bildung*, as well as being educated within the framework of progressive pedagogy, implies an embodied integration of character and mind, a fusion of meanings and values of facts, as well as supporting students' desires and imagination. But, in order to become intellectualised, such desires are transformed into a genuine interest in problems provoked by the observation of things. Dealing with real challenges and objects which one (students) really cares about and feels strongly for, ought then to be reflected in the creation process and awaken students' motivation per se (Dewey, 1933).⁵

Problem formulation and problem-solving are essential in his pedagogy, as problem-solving itself entails imagining other events similar to or different from the experienced. Imagination then develops during a process of creative thinking in which students are encouraged to ask stimulating and critical questions (just like Pippi).

INVENTION AND IMAGINATION IN THE 1970S

While the problem-solving elements of Dewey's pedagogy has aroused renewed interest in the 2000s (Renier, 2016), the democratic, critical, and social aspects of his theory are played down, contrasting with the problem-based learning appearing in the 1960s and 1970s. At that time the Scandinavian countries were particularly oriented towards the international reform pedagogic theory and its appreciation of the child's personal potential. New space was provided for pupils to develop creativity, as well as having a say within education. In 'the golden era of Nordic social democracy', social virtues, such as equal opportunities, co-operation, and solidarity were considered the main formation goals of compulsory schooling. This was reflected in comprehensive schools as both political objectives and as democratic socialisation of pupils (Telhaug, Medieås, & Aasen, 2006). During the construction of the Nordic welfare states at the time, massive investment in public education took place.

Besides general investments in further education/higher education, during the '70s nuclear power plants were introduced as a potential solution to the lack of energy from oil, due to the international oil crises in 1973 which affected the economy, resulting in a large recession. At the time, power supply was publicly owned and solely based on oil and coal power plants. Raw materials were needed, and education was regarded as both human capital and as a public good. The political response consisted of investment in 'more education' and the creation of conditions providing less dependency on oil. The dominating political discourse within the power supply area favoured public nuclear power plants.

In Denmark, the innovation narrative told about the Tvind windmill reflects an upcoming new *Weltgeist* in the 1970s. Established authorities were challenged by young people with new ideas about democracy and education, and by upcoming new and radical ideas and movements, such as women's liberation movements and anti-nuclear movements, all of which expanded during the 1970s. At the same time, there was growing environmental awareness towards ecology among young people. In this *Weltgeist*, the educational reforms of the 1970s had their starting point. Hegel's concept of *Weltgeist* reflects the belief that each time period and its unique spirit is a stage in the development of World Spirits itself and individuals are themselves expressions of their place in history and its limitations (Magee, 2010). Imagination flourished and was manifested by societal change and technological inventions that reach into the society of today.

New Pedagogy at University Level—Problem-Based Learning and Critical Pedagogy

Returning to the 1970s, we recognise this *Weltgeist* as reflected in critical pedagogy which was deliberately practised at the new universities in Aalborg and Roskilde as problem-based learning. This meant, student-defined problems were setting the agenda for students' research. The new university pedagogy made way for studies based on problem formulation and problem-solving through investigative initiatives driven by students and teachers in common. (In the early years, this policy and pedagogy resulted in huge public debates and resistance, especially towards Roskilde University, as it was considered too revolutionary, but today Aalborg University is known as a university whose graduates are excellent cross-disciplinary and collaborating employees). In the beginning, the university pedagogy was influenced by the key assumption that critical pedagogical practice has the potential to promote transformation of individuals and society (within the arts and social science studies). Ideologically, this pedagogy seeks to develop a critical awareness of problems, power structures, and inequalities. Within this framework, a potential creation and recreation of democracy is linked to students' engagement with communities and authentic learning (like building a windmill and being engaged in the solution of real societal problems).

B. LUND

Founded in 1974, Aalborg University constitutes a new educational response in a period of time when the city of Aalborg found itself in an almost existential crisis, heading towards a transformation process during which it developed from being an industrial town with shipyards and cement plants, towards becoming a city that is rooted in what we now consider to be ‘the knowledge society’. The number of blue-collar jobs was rapidly declining, and huge public investments were no longer a generally welcomed public solution to the economic crises due to higher taxes. But, some collaborating ‘innovative’ citizens expected the university to transform the city and its reputation as a ‘working-class’ city. Later the number of students grew quickly, from 3,000 to 20,656 in 44 years, and created an enormous impact on this transformation process.

The Tvind Windmill Innovation Narrative and the Windmill Industry

The educational innovation within the worlds of universities (44 years ago) signifies how educational innovation and new ideas were contested in social and political processes; worked out by complex processes of social construction and reconstruction; and influenced by the actual culture, history, economy, values, and zeitgeist of the time. During the same time period, the idea of building the world’s biggest windmill was fostered by mainly young people and students. It originated in the social movements and organisations of the 1960s and 1970s, when students, as well as some teachers from universities and high schools, actively participated and supported processes towards a more renewable energy supply. On May 29 1975, students at the Tvind Folk High School⁶ took the first step towards the creation of the windmill, and in the same year the nuclear power plant in Barsebäck in Sweden opened, close to the city of Copenhagen.

The windmill soon became a symbol of the movements against nuclear power plants and in favour of renewable energy, as stated by one of the pioneers in the movement for renewable energy, J. Maegaard: ‘The Tvind mill has become a legend’. Maegaard says, that

it was a realization of an idea at the Tvind schools in Western Jutland, in the 1970s, when teachers and students designed and built their own power plant for their own schools—the world’s largest wind power plant at the time. For their own money. They built it for the sake of natural energy, for the sake of a humane society—against monopolisation in the energy sector and against nuclear power. (Maegaard, 2009, author’s translation)

The Tvind windmill became a technological sensation. In May 2005, Tvindkraft’s 30th birthday was celebrated. It is still producing electricity today, while the Swedish Barsebäck nuclear power plant was decommissioned (Olsson, 2005), although there is now growing support to nuclear power plants in Sweden. Denmark later reduced its dependence on imported oil by developing the North Sea gas and oil fields, as well as requiring central electricity generating plants to switch from oil to coal.

THE IMPORTANCE OF IMAGINATION IN EDUCATIONAL CREATIVITY

Today the plants base their production primarily on sustainable energy by combining hydropower plants from Norway and Sweden with windmills in Denmark.

The Tvind windmill story of innovation illustrates a growing competition between two different technological responses to the oil crises at the time. In the construction of the forthcoming innovation narrative I am inspired by basic and very early innovation theories by Everett M. Rogers and creativity theories by Mel Rhodes (known as the Man Behind the Four P's of Creativity) in order to investigate the interconnection between creativity and innovation, as I take a special interest in the sociocultural dimension of innovation and creativity when studying the potential relation between space and place, the present and the future, while going back in time.

As creativity itself is a complex and multifaceted phenomenon, there is no general definition of the term. Creativity definitions tend to be placed in either the product, the process, or the person. Mel, Rhodes, a pioneer in the field of creativity studies, long ago pointed at 'Person, Process, Press and Products' (the four P's) as relevant aspects of creativity, but I find the *interplay* and connections between these relevant to explore. When taking an interest in the creative *Person*, which is often the case within education, one attempts to apply creativity to intelligence, talents, and habits. *Process* refers to motivation, learning, thinking, and communicating. As no one is living or operating in a vacuum, Rhodes expects all to experience a psychological *Press* from the environment, depending on the interaction between human beings and their reaction to the environment, as well as the press from the environment. Since great inventions very seldom are the work of any one mind, they often have social causes, such as changed needs and opportunities (Rhodes, 1961).

Ideas are embodied into tangible forms which Rhodes calls Products, and each of them represents a record of thinking at some point in time. In order to explain the relationship between the four P's, Rhodes came up with the suggestion to investigate 'the nature of the creative process from product to person and thence to process and to press' (Rhodes, 1961, p. 309). In the following, I am going to suggest a twist to his proposal, by including the four P's: Person, Process, Press and Products, in order to investigate the nature of the creative process on a bigger scale. I will analyse the Product: the idea of building the biggest and most powerful windmill in the world in two years at the Tvind Folk High School in Denmark; the People, meaning students and laymen interacting with some experts and citizens; the Press, meaning resistance of the time and space in history, and the Process, studied by analysing the influencing factors—the interconnection between the four P's.

THE INNOVATION CONTEXT

As ownership and access to resources tend to influence innovation processes we need to contextualise the innovation. Until recently, the energy sector in Denmark was vertically integrated and comprised about one hundred utilities (mainly co-operatives or municipally owned). The public opinion against nuclear power plant could not be ignored by public companies. The small utilities were grouped into two

partnerships, Elsam and Elkraft, which controlled generation, import, and export of electricity, and planned generation and transmission expansions (Organisation for Economic Co-operation and Development [OECD], 2000). Historically, the industry has to a large extent been run on a non-profit basis. The powerful corporation, the Danish Collaborative Energy Company: Gyllingnæs/ELSAM, was actively supporting nuclear power plants in Denmark in 1973 and was considering the locality of Gyllingnæs in Jutland as the place to build the power plant. At the time, the energy policy discourse was primarily focused on financial issues but, due to public movements, opponents managed to change the agenda from technical issues to safety and environmental topics. Simultaneously, a general public protest against nuclear power plants began to grow internationally, and various emotional and art-based expressions influenced the discourse. The global movement was indicated by the badges saying: ‘Nuclear Power? No Thanks’ (the Danish artist Anne Lund created the badge (Figure 3) in 1976, and later it was translated into 45 languages). In a polite way it showed opposition to nuclear power, while at the same time its smiling sun in the middle of the badge pointed in the direction of sustainability.



Figure 3



THE INNOVATION NARRATIVE UNFOLDING

During this period, the idea of building the biggest windmill in the world came up and involved a group of young students at a Danish Folk High School, together with a bunch of other primarily young people who decided to realise their shared vision by building the world's biggest windmill. Against all odds, they succeeded when several hundred very young people were gathered to physically build the mill. They erected the 100 metres high concrete windmill without any form of professional expertise in building windmills. Due to the collaborative efforts of lay men and engineers working voluntarily, they also developed the technical skills needed during the process. Before the internet, they looked for inspiration all over the world, as well as seeking inspiration from knowledgeable engineers and craftsmen, and they were successful.

Historically, the project draws on inspiration from the physicist Poul la Cour, who in 1891, as teacher of science at Askov Folk High School, was experimenting with

wind power for the production of electrical power and was part of the co-operative movement at that time.⁷ The young people from Tvind gained popular support from all over the country. At the time, various artists and artistic expressions, such as theatre and popular music, expressed concerns about nuclear power plants. One especially ironic song, welcoming a nuclear power plant, created a new discourse as it became clear that no one, in fact, wanted the plant in their back yard. Industries argued that compared to the efficiency of a nuclear power plant, windmills—with their low capacity—could not reasonably be the answer to the political and economic challenge the society was facing. Wind power was not regarded as a serious alternative, and the project did not get any economic support from the state. However, as the area was not regulated at the time, everyone was allowed to build a windmill close to their own residence in order to produce wind power for their own use, so the Tvind mill did not meet any restrictions.

Later, the technical innovations represented by the windmill were recognised by Vestas Ltd, when celebrating the 30-year anniversary of the mill.⁸ A pioneer from Vestas windmills expressed his admiration:

With your wind turbine you made it possible for me to keep believing that one day we too could produce a wind turbine with your capacity. You have also managed to keep the windmill maintained and even develop and install new technology—such as the new converter. More than forty years ago you, Tvind, had the courage to fire up the debate about energy—nuclear power versus other energy sources—including alternative energy such as wind power. (Midtby, 2015)

Engineering students from Aalborg University also paid particular interest in the possibilities of wind power and alternative energy, and many students later graduated with a green profile and paved the way for the university's current position within production and development of windmills.

The (controversial) political concept of this particular Folk High School Tvind may have obscured the importance of this technical innovation. The innovation narrative shows how perception of an innovation (nuclear power plants) led to its rejection in the persuasion stage of the innovations process, due to lack of public support. Protest movements influenced the decision state and were strong enough to enable the political change several years later. The persuasion stage prepared for the public acceptance of another innovation (the windmills) by forming a directly observable physical appearance of a powerful windmill, with one very clear function: to produce electricity without dangerous waste products. This invention obviously made sense to the people involved in the processes as well as supporters, and it later inspired a reinvention of windmills and thereby restructured the entire energy structure, eventually turning it into a huge industry.

The building of the windmill tells the story of the innovative power of a public movement which encompasses culture and traditions from the past by bearing the pedagogy of the folk high schools as well as the co-operative movement in mind.

B. LUND

Given the widespread acceptance and execution of the concept, this narrative shows the power of simultaneous collaboration across different sectors and fields; turning a vision into a powerful observable image through the combination of practical and theoretical knowledge. Although at the time it looked like a fight between David and Goliath—a fantasy, one big windmill versus nuclear power plants—a powerful idea was fostered, and a new discourse was created. Inventors later recognised the challenge, reinvention took place, and development of new knowledge during the process led into the implementation of the idea now backed by public funding and venture capital. Today no one questions the value of the windmill industry, but its origins seem to have been forgotten, and thereby the progressive innovation drives in collective movements.

CREATIVITY DEVELOPMENT AND IMAGINATION IN EDUCATION

The innovation narrative of the Tvind windmill manifested the power of collective problem-defining and problem-solving processes within a pedagogical institution, although the project would not have been realised without support from the surrounding community. The project is evidence that technological innovations are grounded in impartial factors like imagination and emotions.

The emotional driving force behind the creation was ‘fear’ of nuclear power plants and their waste products, scepticism and ‘anger’ towards powerful experts, ‘hope’ by creating an alternative future, and ‘trust’ in the collaborative in order to overcome the lack of specific knowledge. In this climate, new important and alternative knowledge was created by seeking and introducing knowledge from various sources and, in the end, sharing the advanced technical knowledge for further generations to use, as technology in this project was deliberately not patented.

The innovation story demonstrates the dynamics between imagination, creativity, and innovation as parts of a complex knowledge creation process. This is illustrated by Figure 4 ~~below~~. In the constant process of moving from insecurity towards certainty and back, knowledge is produced by creating, playing, and expressing new ideas and conceptualisations. The innovation itself is shown in actualising new ideas. By being open to ideas, and through dealing with uncertainty when playing with new ideas and expressions, the participants moved toward ‘certainty’ by creating and manifesting new technology; they were able to change the existing culture (and concepts) and, in the long run, the society around them.

Although arts and humanities are regarded as ‘soft’ knowledge areas, artistic knowledge implies the ability to cope with uncertainty when operating in an open field, while technical knowledge is polarised as ‘hard’ knowledge, dealing with subjects that can be quantified, captured, and codified. A (false) duality between the two areas may hide potentials and the need for correspondents in order to come up with new solutions, i.e., to societal challenges. Art and artist create and reflect new visions and ideas which may influence what the world will look like in the future, as art is able to communicate shared emotional responses to different subjects.

THE IMPORTANCE OF IMAGINATION IN EDUCATIONAL CREATIVITY

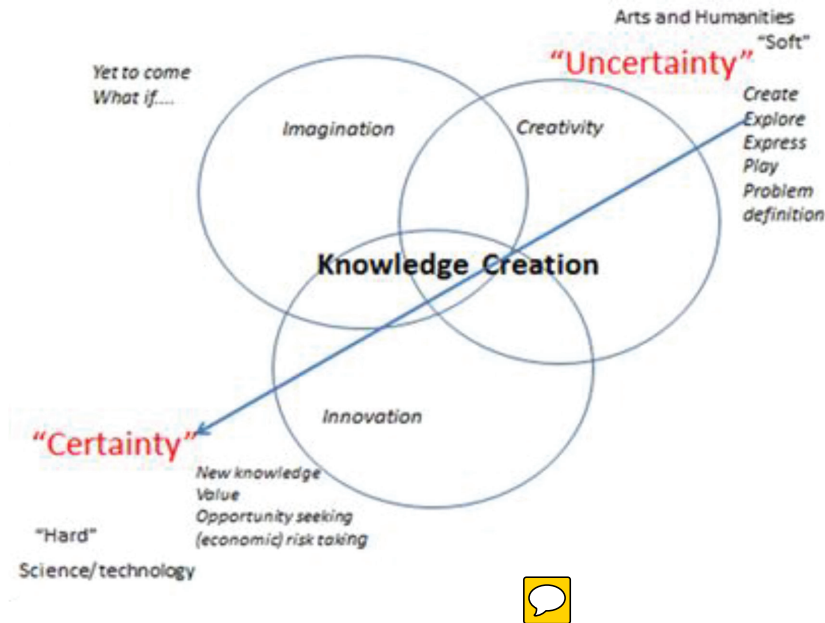


Figure 4

This study of an innovation process further supports the system model by Csikszentmihalyi (1996) in which he includes the study of the social and historical milieu in which creativity and innovation unfold, while showing the importance of ideas and the support of these, as well as the crossover between different sectors and knowledge domains.

In this case, creativity development was part of a social response to critical situations, and the response was realised by involving cross-sectorial and *across*-knowledge domains. The innovation—the product—was realised by commonly developed imaginations in different materialisations. From a pedagogical perspective, it points towards the emotional aspects of innovations as students' passion seems to create the mental energy needed to continue and fulfil an idea. Subjective individual experience contributes to the mobilisation of *shared emotional* experiences, leading to new common social actions and societal change influencing the future direction of society. In this case, the students participated in a self-cultivation and educating process as agents, and the creation of meanings was related to their desires and imagination. Through this process they learned to think, to question, to feel, and to act when solving problems, in an interconnected learning process, as expressed by Dewey:

Human beings are not normally divided in two parts, the one emotional, the other coldly intellectual—the one matter of facts, the other imaginative [...]

B. LUND

There is no integration of character and mind unless there is fusion of the intellectual and the emotional of meaning and value, of fact and imaginative running beyond facts into the realm of desired possibilities. (1933, p. 278)

This means that the emotional aspects of learning and thinking are to be welcomed in order to make the right decisions. Dewey perceived learning as social and dynamic and, most importantly, affected by the quality of interaction between person and environment, since knowledge and skills from one experience become an instrument of understanding in the coming situation. As the image has an effect on the course of action taken and in turn may be transformed by that very action, during this process change occurs in both the self and the environment when interacting.

To be innovative from this perspective, some routine habits are to be challenged, as they are narrowing the field of further experiences in contrast to that expansion of the students' meaning-horizon, which seems to be the essence in innovating thinking processes.

CONCLUSION

The innovation narrative implies that creativity and imagination today are valued as *a means* to economic growth. This awareness is shown through political and economic support for the fostering and creation of an 'entrepreneurial mindset' and talent development within education. Along this line, it is worth mentioning that no single person was ever acknowledged as *the* inventor of the Tvind Mill, opposed to the tradition of recognising great inventions by recognising *the* inventor. The windmill project implied the competency of forming and establishing cross-sectorial collaborative networks, where sustainable technological knowledge developed from dealing with insecurity and complex problem-solving; however, the production of the Tvind mill itself was not an isolated and goal-directed rational innovation process sparked by a recognised need and driven by the market and profits. As the analysis shows, the ground-breaking idea was not fostered out of the blue by special talents, but by mutual and cross-sectorial efforts. By participating in this building process from the beginning to the end, this group of young people experienced physically the potentials in contributing to the realisation of a common imagination and its resulting ideas. They learned by experimenting and trying out new things. In a pedagogical terminology, this constituted authentic learning situations in a very open educational environment. Due to the historical tradition of the Folk High Schools, in Tvind there are no exams and students are not receiving any grades. There is no fixed curriculum, and although students have to pay tuition fees, the Danish state supports this kind of school financially. This creates the time and space to think and to experiment, being inspired by actual cultural and societal challenges.

The innovation narrative further indicates the importance of social movement as an agent of change. In this case the anti-nuclear campaign paved the way for

a technological alternative originated through a common bottom-up process, as an imaginative and emotional response to insecurity, initiated by questioning and challenging the established knowledge, politics and expertise within the field. This points towards an important aspect of knowledge creation being the human capability of imagining other events similar to or different from the one experienced. This creative attitude thrust together curiosity, formulation of new questions, and generation of possible expansions and testing of theories when acting. Important new knowledge seems to result from a sense of insecurity and intuition, as well as from questioning established truths and convenience; thus the ability to move back and forth between ‘uncertainty’ and ‘certainty’ until a solution is created (Figure 4) is both fruitful and needed in order to innovate.

This narrative incorporates the role of the arts in innovation processes—as its ability to provoke and inspire by expressions of new visions manifested in shared cultural symbols (lyrics and stories). Some of these images possess worldwide appeal (like the Pippi stories and the sun badge), as artistic expressions are part of the way humans express and experience themselves emotionally when creating meaning in actions and beliefs. Through art and artistic expression, we make sense of ourselves individually and in common, which seems to support and enhance the power of collaboration. Csikszentmihalyi (1996) underpins that what we call creative is never the result of an individual acting alone, it is the product of three shaping forces—social institutions (fields), a stable cultural domain, and the individual, who brings about change in the domain that the field will regard as creative. For me, the innovation narrative points to the fact that creativity is essentially connected to the ability to imagine how things could be different, and connected to questioning: to the belief that the world can be changed. The innovation narrative further shows that in order to create real change, an image must be shared and supported, emotionally or/and economically across domains. But innovations also imply power issues manifested in laws and access to resources in time and space (e.g., if the Danish energy sector (and the power plants) at the time had not been publicly owned, it would have been far more complicated to politically influence the energy policy and create alternatives). The result might be a product (as the bottom-up windmill innovation shows) or a story (such as Astrid Lindgren’s) that innovates the way we conceptualise education, gender, or pedagogy. This does not imply that all imaginative or creative ideas are considered progressive or deserve to be realised; education has an important role to play in order to support critical reflection and moral aspects in knowledge creation, in order to educate.

Schools, universities, and society in general ought to welcome and reinvent reform pedagogy, as learning to think and to question *might* lead to progress, depending on how the critique is expressed and how we deal with it within a democratic setting. Our common future may very well depend on our ability to collaborate globally and internationally in order to solve our greatest common challenges, such as inequality and climate change. Consequently, education must encourage *all* students to have a voice, to criticise, and to welcome ideas and imagination in order to acknowledge

B. LUND

the strong connection between democratic formation in education and students' creative potentials within—as well as outside—universities.

NOTES

- ¹ Partnership P21's mission is to serve as a catalyst for 21st century learning by building collaborative partnerships among education, business, community, and government leaders. <http://www.p21.org/members-states/how-to-get-involved>
- ² Since 2000, the UN has been promoting the Millennium Development Goal to achieve free universal primary education for all, regardless of gender, by 2015.
- ³ The Human Capital Index ranks 130 countries on how well they are developing and deploying their human capital potential. The Index assesses Learning and Employment outcomes on a scale from 0 (worst) to 100 (best) across five distinct age groups to capture the full demographic profile of a country.
- ⁴ Which later became world famous in different variations. Only in 2008 in a new French version of Pippi was allowed to present herself in an uncensored version! (Munck, 2008).
- ⁵ Which is a challenge as students, schools and education may have different understandings of what 'real challenges' means.
- ⁶ The Danish folk high schools offer non-formal adult education. Most students are between 18 and 24 years old and the length of a typical stay is 6 months. The folk high schools are boarding schools without academic requirements for admittance and there are no exams. The concept is associated with N.F.S. Grundtvig (1783–1872), a Danish philosopher, poet, educational thinker and clergyman. The concept arose in the 19th century and is one of the cornerstones of the Danish educational system.
- ⁷ La Cour's mill produced electricity for the folk high school and later also for people in the town Askov, and some experience from this project was transformed into the new project. (This windmill was operating until 1968.)
- ⁸ Today, Vestas is one of the largest wind turbine companies in the world. It has an operating income on 906 million EUR (2015). Vestas windmills used to produce 22 kW or 30 kW, and just recently started to produce 55 kW. In comparison, the Tvind windmill's turbine had a 1725 kW generator capacity.

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B. LUND

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