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Sustainable Innovation of Glass Design and Craft – Maria Sparre-Petersen

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Introduction

The aim of the research reported in this paper is to reveal a possible connection between aesthetic innovation and implementation of ideas of sustainability into glass design and craft processes. To do so the following research question is currently under investigation:

In what way, if any, can principles of sustainability inform the creative process and contribute to generation of aesthetic innovation within glass craft and design?

The basic assumption is that sustainable practices along with more focus on cross disciplinary international interaction and collaboration, information and communication technology, networking and entrepreneurship will supply the tools for the next generation to develop new ways and possibilities for maintaining and sustaining human life as well as natural diversity on our planet.

As opposed to other creative fields, e.g. fashion, textiles, furniture and more, barely any research has been done into implementation of sustainable principles in the field of glass design and craft. A common tendency among students and practitioners is to consider it desirable but problematic if not impossible to develop a “truly sustainable practice”. Generally glass crafts people and glass designers aim to explore new aesthetic possibilities for the material, and see sustainability as a hindrance for aesthetic freedom, thus contributing to what Fry, in his book “Sustainable by Design” (2009), observes as the mainstream understanding of design that lacks deep understanding of the full holistic impact of our actions on the planet. This is counterproductive to sustainable development and combined with the fact that only few countries in the world are effectively recycling their waste glass there would seem to be reason to examine the current practices from a critical analytical perspective.¹

A critical analysis of the existing practices as well as development of a new best practice may imply changes across the national and field specific boundaries toward a more rational sustainable

¹ In Denmark 88% recycling of waste container glass was reported in 2009 (Miljøministeriet 2014). In the US around 34% of the used glass was recovered for recycling, according to the US Environmental Protection Agency (2014), in England 60 % is recycled according to the national recycling campaign “Recycle Now” (2014). Glass that is not recycled end up in landfills or in incineration plants where it produces clinker that cannot be upcycled.

behaviour, and may be an incentive to begin to unfold the glass field's possibility to make a contribution to the general sustainable development.

By changing the practice of the researchers in the main educational institutions and especially by changing the way we teach the subject of glass design and craft from using non-sustainable methods, materials and techniques to include sustainable principles, the new glass designers will learn skills that will enable them to change an immediate future that will be increasingly influenced by over population, mass migration, massive environmental devastation, and accelerated garbage accumulation.

The practical approach of engagement of students in hands-on experimentation with sustainable materials and techniques may imply or provoke a shift in the attitude of my peers from believing that sustainability automatically fosters a specific "green aesthetic", toward envisioning or at least acknowledging the possibility of aesthetic freedom generated by using sustainable ideas as triggers for innovation. This paper will address *how* we may implement sustainable ideas in our material specific creative practice and *how* this may initiate a shift of paradigm away from the current common practice of the field mainly focussing on concept and form and towards a practice that is concerned with form on the basis of a deep understanding of impact as Fry (2009) calls for.

The sustainable impact of recycling is evident. Glass can be recycled indefinitely and no new materials are needed in the melt. By using recycled glass instead of new raw materials a reduction of the energy consumption for melting the glass can be obtained, resulting in a reduction of the CO₂ emission of approximately 315 kg per ton glass (Waste Online 2011).

Today glass production predominantly consists of window glass, glass wool for insulation and containers such as bottles and jelly jars. Glass household products and artistic work hold only a fraction of the market. Still there is reason to believe that generation and implementation of new knowledge about sustainability in the fields of glass craft and design is desirable since, according to Friedman (2004), these fields influence trends in the patterns of consumption, through what is defined as the trickle-down effect.

Method

Walker (2006) argues that engaging in the practice of designing is a transformative step that distinguishes design from many other types of inquiry, and that theoretical ideas inform the design of an artefact and in turn, contemplation of the artefact can advance the development of ideas.

Building on Walkers thesis, a practice-based qualitative research methodology is adapted in this research. Hence, the empirical material is generated through experimental hands-on activities carried out by myself in the lab as well as through field work in the form of workshops with a variety of focus groups.

This paper will describe and discuss a specific case study that took place at The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation (KADK), Nexø Campus, in the spring of 2014 on the Island of Bornholm, a rural Danish region located in the Baltic Sea. The case study consisted of a workshop involving students of glass craft and design in a process that introduced them to sustainable principles. This study will be briefly compared with experiences from an earlier study: a workshop held at KADK, Copenhagen Campus, in Copenhagen, the capital city of Denmark, with students of design with no previous experience in glass making. The two workshops both included 1st year students. The first had 10 participants the second had 15, the numbers being average for classes offered in glass making at most higher education institutions, although not sufficient to constitute a broad representational material.

In addition to the discussion of the case study, it is addressed how a research-institution may contribute to bridge a gap between regional and urban sustainable developments.

The empirical material is described and discussed in a narrative fashion and the conclusion that is produced is meant to suggest a best practice.

Bridging the gap between the urban and the regional sustainable initiatives

KADK, Copenhagen Campus has 1500 students at BA, MA and ph.d.-level, the Nexø campus on the island of Bornholm has 70 students at BA level. The Copenhagen campus is providing the necessary platform for educating researchers on ph.d.-level; in close proximity to a research environment, fellow students, partner institutions, networking opportunities, exhibition venues, course offers, major businesses of the trade etc.

The Nexø Campus is offering great lab facilities to a group of dedicated glass students at BA level. This enables a symbiosis where the research performed mainly in the city benefits from the regional support for the countryside campus as well as from the opportunity to engage the students in research activities, and the region benefits from the research performed at the city campus that supports the local education.

In the 2012-vision for development of the region of Bornholm, one of the four main focus points was called "Bright Green Island 2014" addressing issues of sustainable innovation (Bornholms Regionskommune 2014). The fact that the island is remote and isolated was considered an advantage for working with sustainable development by the local administration, because it is easy to monitor especially the energy-consumption.

For the purpose of carrying out the workshop where we planned to use recycled soda-lime glass (bottles and jars) as an alternative to the more toxic and less easily recyclable barium crystal preferred by most Danish glassblowers, the intimate relations between the islanders and the regional focus on sustainability constituted a solid platform. The curriculum taught at the Nexø campus has included glass design and craft for almost two decades, using the traditional barium crystal for all educational activities, except for a few occasional recycling efforts initiated by individual students.

The suggestion of infesting the kiln pots with recycled soda-lime glass that had been rejected on previous occasions was now warmly welcomed by the staff members who saw the necessity and potential of the idea. The school workshop manager contacted the local recycling centre that supplied the glass for free. The glass had already been crushed and divided into three different colour fractions and just had to be washed before the melting could start.

Thus, the conditions for supporting the research were readily available and the research for supporting a BA-level educational activity with sustainable content was enabled due to the collaboration across the boundaries of a regional and an urban context.

The workshop “Glass and Sustainability”

The workshop named "Glass and Sustainability" took place at the Nexø campus over a period of four days. The participants were 1st year students most of whom had previous professional experience in glass making. As explained in the introduction, the idea was to work together with the students and explore how their aesthetic experimentation could be influenced and innovated by changing from the traditional barium crystal glass to the more environmentally friendly soda-lime glass, and through this exercise begin to find out if it was at all viable to influence the way students think and act in their formative years as creative professionals.

The workshop included the following activities:

- Lecture based on my research
- Discussions in plenum

- Research of existing sustainable glass projects
- Making tools for experimentation
- Experimenting in the workshop
- Tutorials, questionnaire and evaluation

Lecture and following discussions

During the first presentation it was revealed that most of the students did not actually know much about the different properties of the different types of glass other than the fact that mixing container-glass and crystal in a melting pot will result in glass that is incompatible with itself and therefore eventually will break. They had even less knowledge of the principles of recycling glass although they were aware that colored glass will tint the whole pot of glass if recycled in a clear melt – which is basic knowledge when working in a blowing facility. We talked about natural occurrences of glass, recycling and the positive influence of re-melting shards (recycled glass) on the CO₂ emissions from the melting process.

It became evident that the students had very different views on the subject of sustainability. Some of them were extremely positive others showed up because it was mandatory and one student did not show up at all. Discussion of issues of outsourcing, of how to create a competitive business, of how to make interesting work and of the students' professional interests indicated frustrations about the subject. Some were very personal and others more concerned with their creative practice. A general issue came up when asking about their expectations for the course: they did not think they had the power to change the negative impact of our trade on the environment and the sociopolitical balance of the global community, even if they would like to. Along with the feeling of powerlessness the most common issue was the fear of limiting their creative and expressive freedom.

Research of existing sustainable glass projects

We went on to find out more about already existing initiatives to expand the knowledge of possible strategies. The most common sustainable idea for recycling glass is to transform existing glass bottles into new products like vases and drinking glasses, by cutting off the bottle neck (fig. 1). This idea can be manufactured by most people with basic technical skills, and a few simple tools. The internet offers a number of do-it-yourself kits for this type of recycling. Results rarely escape the stereotypical recycled aesthetics.



Fig. 1. Cut glass bottle



Fig. 2. Hot manipulated bottle

Glass makers with refined tools and excellent skills can alter container glass by reheating and manipulating existing bottles (Fig. 2.). In this case results also mostly fall within the stereotypical recycled aesthetics. Access to a furnace where the glass can be melted enables the glass maker to diversify the experimentation significantly and therefore hopefully will expand the aesthetic possibilities.

Experimenting in the workshop and creating tools and techniques

When experimenting with molten glass it is important to be able to carry out an experiment several times to begin to find out how the material reacts to the way it is manipulated. The manipulation of the glass is highly sensitive to small changes in the procedure that cannot ever be exactly the same when working by hand. Occasionally it is necessary to make the tools for manipulating the glass as well as making the actual glass. For mass production extremely expensive metal molds are used. This is not an option for smaller operations and especially not for most students. This calls for creation of cheap tools. Wood and plaster are the most common mold-making materials for small scale production and experimentation. To expand the possibilities of techniques for utilising the soda/lime glass I had tested high temperature concrete as a mold material prior to the workshop, and it had proven to have great potential especially for casting- and press molds.

The workshop included an introduction to the techniques of glass pressing and glass casting, techniques that are very suitable for working in soda lime glass because this glass stiffens quickly. These techniques are used for crystal glass too, but mainly in mass production processes. They are rarely used by small operation glass manufacturers and in educational contexts because blowing glass is generally thought to be more fun and versatile. By switching to soda lime glass it became relevant to include pressing and ladling the glass² which again made concrete mold making useful. Thus, the introduction of sustainable glass in the creative process caused possibilities for explorations of new aesthetic expressions.

During the experimental phase with the concrete mold making as well as with the glass in the workshop the students' attitude changed dramatically. The fact that the soda/lime glass had other properties than the crystal and the potentials derived from those properties inspired the students to begin to work in different ways which again sparked new ideas and the use and development of different techniques. The opportunity to blow in full coloured glass, as opposed to the normal procedure of blowing in clear glass and adding the colour on the individual pieces on the pipe was warmly welcomed, as well as the fact that the material was free as opposed to the expensive crystal. Blowing the hot molten soda lime glass proved to be harder than blowing in crystal but not nearly as hard as we had imagined. Some of the students even enjoyed the challenge of having to work faster.

We evaluated the test pieces every day after opening the annealing furnace. The results were promising but needed elaboration and refinement. Therefore the students decided to continue working in soda lime until the end of the semester, to become better at mastering the material and to make more experiments. One experiment that showed potential was the pressing of the soda lime glass into a concrete mold (Fig. 3.).



Fig. 3. Pressed soda lime glass in concrete mold

² Ladling hot glass into a mold is a technique used for e.g. production of tiles.

Comparison with the previous workshop

In the previous workshop where the students were novices to glass they showed no sign of resistance to working in recycled container glass. But in the group of glass students, they knew the technical and aesthetical differences between the soda/lime glass and the crystal glass, and being used to the qualities of the crystal they did not see why they should "compromise". In the previous workshop the two issues of artistic freedom and powerlessness that concerned the glass students never came up, neither in the introduction nor during the course work and evaluation. The students without previous knowledge of glass believed they would be able to push design in the sustainable direction no matter which materials they worked in and they were much less worried about technical and material obstacles in the creative process. On an individual artistic level this may indicate a difference between being new to a field and being immersed in the culture and habits of a field.

Conclusion

The workshop was successful in the sense that students changed habits and attitudes. The hands-on experimental approach was welcomed by all the students who generated a series of innovative experiments with new tools and techniques as well as wonderful mistakes and failures pointing to new aesthetic expressions to explore in their future work. The physical results of the workshop were promising although not taken to a high level of refinement – due to the short duration of the course.

The workshop indicated that when the material is changed, the working habits change too which again leads to potentially new insight about aesthetic possibilities, evidence to support the assumption that principles of sustainability may indeed inform the creative process and contribute to generation of aesthetic innovation within glass craft and design. More experiments of my own and more workshops with focus groups are needed to be able to build a solid argument for the proposition that aesthetic innovation of glass craft and design may indeed benefit from the introduction of sustainable principles in the design process. As of now the results suggest the relevance of further explorations into the subject matter.

The city of Copenhagen involved provided the research environment and the region of Bornholm provided the platform. The workshop contributed to the realization of the regional vision of creating a "Bright Green Island", and this vision paved the way for generation of empirical material for the research that flows back to the research environment in the city.

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