

Emerging Participatory Approaches in Design Education

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Abstract

For decades, the focus of design education has been individual designers' craft-training in certain disciplines, as design is understood as an act of form-giving to add competitive advantages to products/services. The complexity of problems designers need to tackle nowadays, and the audience who also produce content with digital tools and social media change the designer's role in the creative process: a member of a specialist team who facilitates and provides platforms for co-creation. With the new participatory approach in design, academic institutions seek to educate designers who can (a) think beyond the boundaries of traditional disciplines, (b) explore latent relationships between discrete resources from various perspectives, and (c) synthesize open-ended solutions by integrating analytical and abductive thinking.

This study presents two participatory approaches in communication design education. City Sets Media Player is a web-based data collection platform built for exploratory, multi-disciplinary design workshops; interactive narratives composed on this platform blur the distinction between author and reader. The hvMuseum is an online museum for curatorial, contributory, and appreciatory types of user participation. The visualization features on this site foster users' pattern finding and abductive thinking. The findings from this study contribute to new design education methods in the digital era.

KEYWORDS: participatory systems, design education, pattern finding, transformative learning, abductive thinking

Introduction

For decades, the focus of design education has been craft-training in certain disciplines, as design is understood as an act of form-giving to add competitive advantages to products/services. The complexity and elusiveness of the problems designers need to tackle nowadays, however, drive the arguments of design education in different directions as the problems cannot be adequately addressed by relying on individual designers' creativity.

Designers need to collaborate with a team of stakeholders; end-users of the product/service are one of them, and they can contribute with meaningful data or interesting ideas. The team will explore design problems in broader contexts, from various angles, considering technological and other options.

This study aims to initiate a discussion around *what* and *how* to educate future design thinkers with insights gained from two participatory online systems, City Sets Media Player and the hvMuseum, that support the user's learning activities in the research, analysis and synthesis phases. While the hvMuseum is recently opened for data collection and testing with Internet users, the City Sets Media Player was actually put to use in two multi-disciplinary, university level design workshops. How the City Sets Media Player helped design major students' projects evolve overtime, and how the hvMuseum helped users generate meaningful insights out of data will be continued later, after defining relevant trends and theories in the next section.

Literature review

When digital technology and the Internet changed the Communication Industry drastically in the 1990s, many design schools reacted by establishing new departments and courses to teach production skills for Web and Interactive Media. Designers learned to use new techniques and tools, but did they notice the changes in communities, networks and user-behaviours? How should design education be in the future?

Industry trends in Communication Design, and the evolving definitions of authorship

Due to the advancement of technology and social media, many viewers and readers have become producers of digital content in the 21st century. As designers' digital tools become available online and DIY (do-it-yourself) culture fosters creative activities, more people than ever have begun to experiment with what designers do—significant changes in the nature of creative acts, and in the consumption of digital content followed. In the time of *RW creativity* (Lessig, 2008), everyone enjoys the freedom of taking existing works and remixing them to create something new.

Digital tools and social media have exposed the creative industries to active interaction with the public, causing valuing and devaluing of artistic expertise simultaneously (Lupton, 2011, pp. 7–8). The demystification of design, now taking place everywhere, changes the designer's role in the creative process. According to Armstrong and Strojmirovic (2011, p. 11), traditionally Graphic Design is about control—controlling what the audience sees, controlling the typography of a piece, controlling its concepts, but the new trend turns the modernist definition of *design as authorship* on its head, and transforms design into a participatory activity. The newspaper and magazine publishing industry invites the audience to participate and publish their texts, photos and videos on their Internet sites (“Share Your Photos”, 2012). The advertising industry takes old ad campaigns to participatory events: Google Coca-cola campaign (Elliott, 2012), for example, let people actually send drinks all over the world, and the happy looks on the recipients' faces become part of the firm's brand message. The designer's role is to create platforms for co-creation, to produce templates, and to act as *facilitators* rather than authors.

Technical development and open source tools give new possibilities for the participatory design approach. “Programming is the designer's new literacy. [...] Open source tools welcome use without requiring full comprehension of the underlying programming structure.

This efficiency encourages designers to experiment [... without] in-depth technical mastery.” (Armstrong & Strojmirovic, 2011, p. 126) Enabled by the ubiquitous web technologies, products/services designed with the participatory approach exist as what Rubino et al. (2012, p. 22) define Meta Products that will be around us as a web-enabled product-service network whenever we need them.

The new participatory approach in design poses big challenges for design education: a major shift in students’ mindsets from individual to network, from exclusive authorship to co-creation. Academic institutions seek to educate designers who can (a) think beyond the boundaries of traditional disciplines, (b) explore latent relationships between discrete resources from various perspectives, and (c) synthesize open-ended solutions by integrating analytical and abductive thinking. How the academia is coping with the challenges will be continued in the next section.

Relevant educational models and theories

Following such cultural and industry trends, educational models that emphasize *systems thinking*, *pattern thinking*, *abductive thinking*, and *transformative learning* are emerging. Their importance is discussed in relation to the four phases in the design project: research, analysis, synthesis and evaluation.

Systems thinking (Bateson, 1979/2002) drives the focus of learning from the study of particulars to the understanding of the whole system in which all parts are interrelated and functioning in certain contexts. With systems thinking, students can see real-world design problems not as isolated incidents with simple solutions, but multifaceted phenomena that are integral parts of a chaotic and complex system. While systems thinking let students see the big picture, pattern thinking (Bloom, 2010; Volk & Bloom, 2007) helps them recognize recurring patterns from the chaos. The recognized patterns are developed into scientific relationships (causality, e.g.) in the observed phenomena. Later, by testing the relationships in various contexts, students can develop more abstract levels of theories that work across the boundaries of disciplines.

Systems thinking and pattern thinking can be effective guiding principles in the research and analysis phases. Abductive thinking, meanwhile, is particularly relevant to the analysis and synthesis phases as an abduction process involves a creative leap of introducing new elements to the current logic. With abduction, new hypotheses can be introduced (Thagard & Shelly, 1997) to explain the current design problem. The hypotheses will lead to reframing of the problem from various perspectives (Kolko, 2010, p. 23).

Students’ abductive thinking can be observed as a part of transformative learning process, i.e. the idea of challenging students’ value systems and worldviews in conscious and critical dialogues, in order to engage them in learning (Mezirow, 1995; Mezirow & Associates, 2000). The students’ perspectives are reformulated with what Mezirow calls *core elements*, a series of reflecting, synthesizing, and sense-making activities. A design process is also a process of transformative learning, as designers analyze artifacts in creative and critical inquiry (Sanders-Bustle, 2003), questioning all unconscious assumptions s/he might have and knowledge gained from prior experiences.

In this study, students’ narratives of two European cities on City Sets Media Player exemplify pattern finding in the process of transformative learning, while Internet users’ hypothesis building about bread in the hvMuseum project shows their abductive thinking based on

patterns observed in broader contexts. Details of the two projects will be illustrated in the next section.

Exploratory storytelling platform: City Sets Media Player

City Sets is an experimental, multi-disciplinary workshop format to explore urban environment and life, with dialogues between different disciplines of art and design, and with audio-visual ethnographical study and storytelling methods. Urbanization has become a global mega-trend in the 21st century, since already half of the world's seven billion population live in cities. Cities can offer a more ecological way of life than dispersed settlements, but urbanization, when it causes severe social problems, can be a wicked design problem. It challenges city-planners, engineers, social scientists, as well as designers and artists to investigate and improve people's everyday life in cities. Reflecting on this issue, the City Sets workshop encourage its participants to see the city as a *stage*, passers-by as *actors*; the metaphor *sets* calls to investigate design elements, visual languages and narratives embedded in the cityscape (Seliger & Tuomola, 2012).

Two City Sets workshops were co-organized by two academic institutions in Helsinki and Paris in March 2012. The week-long multidisciplinary workshops consist of a whole-day seminar with invited artists, software tutorials, fieldwork, group critique sessions and final presentations on the fifth day, followed by essay writing. Students from different faculties worked in groups of 2–4 persons. During the fieldwork session, students scouted a certain subway station with cameras and video-recorders. They were advised to enter places without preconceptions or shooting plans, letting their perception guide their observations. Collected materials were discussed with faculty members from both academic institutions, in terms of themes, narrative structures, and aesthetics. Each group of students analyzed their observations and collected materials in order to find the most expressive phenomena, the identity of the place, or a visual story. Their findings were synthesized into visual narratives. After making several revisions, students gave their final presentations on the last day of the workshop. They reflected on the whole working process and learning outcomes in their essays.

In the workshops, visual ethnographic method is applied in thinking over and archiving the urban environment where stories of human life unfold (Seliger & Tuomola, 2012).

Ethnography is a systematic, scientific method to learn about social and cultural life in communities. It is a locally specific method—researchers must first discover what people actually do and why, before trying to interpret their actions through filters from researchers' own personal experiences, or theories derived from professional/academic disciplines (LeCompte & Schensul, 2010, pp. 1–2). This principle gives a good basis for artistic investigations as well, because it encourages the artist to shift the goal of investigation from his/her artistic intention to unknown actors and artifacts in the city.

During the analysis and synthesis phases, the faculty guided students to pay attention to the complexity and variety of perspectives found from the collected materials. In the students' visual narratives, video clips were arranged in different but coherent parallel sequences (Figure 1); the interactions between the clips invited the audience to continuously find connections (i.e. meaningful patterns) between them. These multi-linear narratives "prioritize the role that seeing plays in understanding, they also encourage the engagement of other senses through a careful study of art elements and principles." (Sanders-Bustle, 2008) The use of sound in the clips added an extra dimension to the narratives. Students had choices between keeping the original sound and including a new one. Their choices had an impact

on the resulting narratives and how they were interpreted. The clips presented with original sounds invited the viewer to critically reflect on what they see and hear, in relation to the locations where the clips were shot. The clips with new sounds, however, discarded part of the original contextual information; they were less open to critical reflection, but invited more creative interpretations.



Figure 1 Final Presentations of Multi-linear Narratives on City Sets Media Player.

Throughout the workshop, students used City Sets Media Player (citysets.net/city-sets/play) as a platform for data storage, analysis, and synthesis. On this platform, image and video materials were posted under four categories: design objects, persons, cityscapes and events. The keywords and annotation tagging feature allowed for primary analyses of the materials according to author's name, the place and time of shooting, e.g. Later, the player worked as a presentation tool: students arranged multiple video clips (split-screen techniques) in various formats and composed multi-point-of-view narratives for their final critique. It served as an *open sketchboard* for the students to select, add, and combine materials collaboratively, like a collage.

Students' initial research findings, final presentations, and essays written after the workshop exemplify how the visual ethnography method guided their thinking to be more systematic. Comments made during the final critique point out how the audience found meaningful connections between video clips juxtaposed on the Media Player. The comparisons of students' comments/writings after each phase show their evolving ideas. Findings from the City Sets workshops will be discussed in depth in Section 5.

Participatory data collection platform: the hvMuseum

The traditional idea of a museum is a place for housing and displaying artifacts of scientific, artistic, or historical importance (Lampe et al., 2008) for the public. Thanks to the museums' limited physical spaces, however, only selected artifacts, chosen by experts and curators, are collected and often the collection is not a balanced representation of all forms of human life and man-made artifacts. For instance, the collection of chairs designed between the 19th and 21st centuries at the Art Institute of Chicago have great artistic value, but they do not represent the myriad of regular chairs and all ordinary but essential human activities happening around them. Often museum patrons lose the opportunities to see artifacts that are recently invented or currently used, because their importance is still in the making, and their availability makes them less valuable for collection.

The hvMuseum project addresses the aforementioned opportunities. It is an online platform for data collection and exhibition of current and rather mundane artifacts from around the

world, such as bread that people eat everyday. A piece of bread would not be considered highly valuable if it is available for purchase everywhere, but a large collection of bread data can be a valuable source of information. Firstly, if the data are gathered in a structured format with a well-defined list of attributes, the data entries can be analyzed in various formats. The analyses will lead to hypotheses and further study questions, providing Internet users with informal learning experiences, as is often observed in physical museums (Atkins, 2006; Crowley & Callanan, 1998). Secondly, if the data are a well-balanced representation of cultures around the world, the collection can promote cultural awareness. With more accurate pictures of current lifestyles in other countries, Internet users may have the opportunities to breakdown their wrong stereotypes and develop respectful attitudes and deeper interests.

For the goals, the hvMuseum provides a web-based data collection platform for the Internet users from around the world to post authentic and up-to-date information on specific artifacts. The hvMuseum website is designed to provide interfaces for three types of museum visitor participations identified in previous studies (Dalsgaard et al., 2008; Roussou et al., 2007; Simon, 2010): contributory, appreciatory, and curatorial. Internet users can participate as contributors who post data, as visitors who appreciate and rate the quality of collections, and as curators who decide which collection to open.

Contributory, appreciatory and curatorial types of participation

The hvMuseum website started with one collection, *bread from around the world* (www.hvmuseum.com/museum/bread_matrix). 40 or more Internet users recruited online participated in data collection and commenting-rating activities. For the contributory type participation, the site accepts bread type entries with 17 required and optional attributes (title, flour type, shape, images, length, recipe, food paired with, occasion, etc.) For the appreciatory type participation, the site provides rating interfaces for the accuracy, quality of presentation, and uniqueness of the item as a museum entry, plus a comment box. For the curatorial type participation, the site provides a poll asking what the next collection should be. The author had to open the first collection with bread data for this study, but the next collections will be added according to the poll result (at this point, *shoe* or *flower* earned more votes than others).

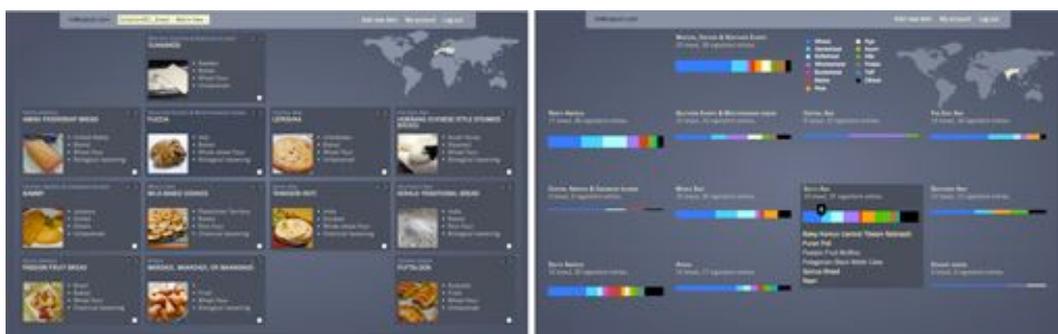


Figure 2 The hvMuseum.com: the Matrix view (left), and the Ingredient Comparison view (right).

Visualization features in the hvMuseum

Currently, the hvMuseum provides two visualization features, the Matrix view and the Ingredient Comparison view (www.hvmuseum.com/museum/bread_ingredient). Firstly, the hvMuseum categorizes and displays its collection in a matrix of 12 regions (Far East Asia,

South East Asia, Oceania, Central Asia, South Asia, Middle East, Africa, Mediterranean, Europe-Siberia, South America, Central America, and North America) that sum up the sovereignties, climates, and cultures around the world (Figure 2, left). A world map added to the Matrix view shows where each region is. The two-dimensional matrix enables two directions of comparisons, horizontal and vertical—the ‘h’ and ‘v’ in ‘hvMuseum’ mean horizontal and vertical. Comparisons in horizontal directions are comparisons of artifacts originating from the similar latitudes and climates, whereas comparisons in vertical directions show artifacts originating from the various cultures with similar longitudes. The Matrix view invites users to think about the impacts of natural and cultural conditions on the human lifestyle, exemplified with artifacts produced in each region. Secondly, the Ingredient Comparison view (Figure 2, right) sums up all regions’ bread entries and their base ingredients in 12 bar charts. As more than one type of flour can be mixed in one bread, both the numbers of bread entries and flour type entries are displayed. The bar charts are displayed in the same matrix format for horizontal and vertical comparisons. 22 Internet users from around the world were invited to try both Matrix and Ingredient Comparison views, and their insights (submitted in writing) will be shared in the next section.

Discussion of findings

In the City Sets workshops, the audience found meaningful stories from the students’ work by connecting juxtaposed clips. The stories actually evolved in the process of transformative learning, after each round of discussion with team members and the faculty. In the hvMuseum project, Internet users found plausible ways to explain the patterns they observed from two visualization views.

Evolving ideas expressed in students’ visual narratives from City Sets workshops

The City Sets workshop results and students’ essays show that the visual ethnographic method to gather and analyze material on the City Sets Media Player can guide students through a transformative learning process in four phases. All quotes in this section are excerpts from students’ essays.

Disorienting dilemma. To introduce visual ethnography, the students were asked to observe and document four focus areas in the city: design objects, persons, cityscapes and events. When in the field, the students found that these focus points did not apply as rigorously as they expected, and that caused confusions and challenged their previous set of assumptions.

We went to the field thinking about the four focuses of interest that were mentioned in the brief and assuming to find certain things [...]. We got very confused when it turned out to be something completely different.

Dialogue. The brief as a disturbing dilemma created dialogue between the students. The team members with different backgrounds had to verbalize their ideas, and discuss their frames of reference on design. Dialogue, a core element in the transformative learning, is essential to negotiations and agreements on task assignment and workloads. It is part of relationship-building and awareness of context.

When we realized that [the four categories] were not meant as strict categories, we rearranged our photographs and recordings according to themes that we had discovered when browsing through our raw material.

Context awareness. The collaborative exercise to gather visual information of the city in order to produce visual narratives deepened the participants' understanding of their surroundings. In this workshop, awareness took place while gathering materials (still photos, video and sound), uploading and classifying them in the Media Player archive. The process helped the learners explore untapped links between different types of information and think in a trans/multi-disciplinary way while testing their files in different combinations for reflection and synthesis.

We ended up with loads of photos and video clips, and choosing was the most difficult part of the process [...] but at the end the result was showing quite well the mental process we went through from the neon light to coffee cups.

Critical and creative reflection/synthesis process. The City Sets Media Player was a key tool in the transformational process, as students engaged in critical reflection among the group through dialogues to reach consent. The Media Player worked as a springboard for meaning making and allowed the synthesized narratives to surface. It made the synthesis processes visible. "When synthesis is conducted as a private exercise, there is no visible connection between the input and the output" (Kolko, 2010, p. 25), but with the Media Player, synthesis occurred from a coordinated effort of the group. In the end, the students' stories were products of co-creation in that they evolved several times with team discussion, faculty comments, and interaction with the audience.

[...] we had expected that [the video clips] would be presented in random order, that it would not be us but the viewer who would choose which videos to see simultaneously [...] it would be up for the viewer to make her own decisions about the narrative. [...] After listening to the comments of the tutors and especially how they saw a narrative in our presentation where we ourselves could not see it, I understood that there is a much bigger thing I learned about myself [...] I had intuitively created a story with my photographs, but didn't know how to conceptualize it - or maybe I was afraid to conceptualize it. I guess I don't trust my own voice enough yet.

Patterns, user knowledge, and hypotheses observed on the hvMuseum

From the verbal data collected with the hvMuseum, the authors found traces of pattern thinking and abductive hypotheses. Users' current knowledge played two opposite roles in the process: Firstly, the knowledge worked as a schema through which users understand new information and reinforce their current systems of knowledge. Secondly, when presented with new information, some users contrasted it with what they know; their current knowledge functioned as a frame of reference, and it was expanded to accept new concepts. After building their own understanding of breads from each region, users attempted to explain their characteristics in relation to several factors.

Pattern Finding. After trying two visualization views on the hvMuseum, the Internet users began to make generalizations, either from the differences they found between regions, or from similar items found across the regions. The Ingredient Comparison view somehow contrasted breads from the European or North American regions, and the ones from other regions.

... breads from Europe, Siberia and North America are almost always made using wheat or rye, and are almost all baked. [...] these regions have the greatest variety of breads, though are mostly

savoury. Also, bread in the Far East has the largest variety of types in terms of base ingredients and cooking methods. (user from the UK)

Some commented on shape similarity between breads observed across the regions:

Unleavened breads from around the world such as Pita, Tortillas, and Naan are often substitutes for other starches such as rice. [...] From China there are Mandarin pancakes [...] that are similar to a burrito. Ethiopia has large pancakes that practically cover an entire table as this is the plate in which stews are ladled. The bread is also the main eating utensil... (user from the US)

Users' Current Knowledge Matters. While looking at the data, users either reconfirmed their current knowledge, or expanded/modified it with new additions. Some users started their observations from what they know, and found more similar examples from other cultures. Their current knowledge remained as their schemas in the end:

... all [bread] can come in some stuffed forms. [...] whether they are from American region or Asian, they all are round in shape, either flat round like the dosa and pizza or rolled round. (user from India)

Others paid attention to rather unusual items from their standards that were contrasted to their current knowledge of bread as a frame of reference:

Some of the Far East Asia breads looked strange to me like the "An-beung Jin Pang", "Meron pan", and "Wotou" breads because all three of them looked uncooked. [...] I was surprised to see burger bun as a bread listed under the North American category. I guess I hadn't considered that as a bread before I guess mostly because they are manufactured today and nobody makes them at home anymore. (user from the US)

Breads from the European-Siberian region seem to be, in general, heavier and darker than bread we eat here in the United States. [...] Far East breads are very different from traditional US breads. Some look like pancakes, dumplings, and buns. (user from the US)

I never really thought of a tortilla as bread, but now I realize it is. (user from the US)

Abductive Hypothesis-Building. From the simple observations made, some users went further and tried to explain their findings with hypotheses. In addition to the availability of different crops, users talked about history, religion, price, international trade, ease of use, and culinary culture in each region:

I can see that only wheat is used to make bread in Central Asian region. [...] the climate and soil conditions of that region will be favorable for the cultivation of wheat and [...] they] won't be favorable for [...] other crops like rice, maize, acorn etc. (user from an unknown region)

... a tradition of bread in Asia, especially East Asia, seems to have many characteristics of Western and European bread traditions, likely a reflection of food traditions that came along with British and European Imperialism. (user from an unknown region)

The ingredients for each bread and the methods used in mixing and baking reflect growing conditions and resources prevailing in the locality [...] International transport and distribution systems in modern times have widened the range of ingredients available in each location. [...] it is possible that wheat flour has qualities which make it more popular than other flours in those areas where there is a choice – perhaps price, retaining freshness or ease of use. (user from Australia)

... due to differences in climate, geography, crops grown, climate and available cooking ingredients (spices, oils, seeds etc) and [...] the eating habits of the region. (user from India)

Central America and the Middle East there is a predominance of unleavened bread. [...] may have something to do with the unleavened bread associated with Jewish holidays in the Middle East. (user from an unknown region)

Some users raised further questions to look into:

Considering most breads are leavened all around the world, it makes me wonder when people figured out how to use leaveners. (user from the US)

Lessons learned from the two online participatory systems

From the experiences of building and testing City Sets Media Player and the hvMuseum, the authors found potentials and limitations of online participatory systems for design education.

With effective database design and various visualization features, an online data repository system can support the designer's creative thinking process. As a research tool, the system can expand students' current knowledge on a subject with accumulated data and tagging features: the basic attributes (region, type of flour, shape, etc.) and tagging (occasion, related food, etc.) features on the hvMuseum.com can orient students' perception of this ordinary item bread in broader contexts: geography, climate, culinary culture, and history.

Accumulated data can be repurposed for other data visualization projects.

As an analysis tool, the system can help by filtering, relating, and projecting schemas on data. The advanced search feature on City Sets Media Player let students create a subset of filtered data with which students can create cohesive interactive narratives. The tags added to each bread entry on the hvMuseum reveal various relationships: in what occasions the bread is eaten, or how it is related to other bread and other food items. The Matrix and Ingredient Comparison views are examples of schemas that put data in certain perspectives. New knowledge and perspectives gained in research and analysis phases lead to designers' out of the box thinking in the synthesis phase. As a synthesis tool, City Sets Media Player was an excellent tool for students to test their temporary narratives in unlimited number of formats.

Online data repository systems, however, have only limited use in design education if the accuracy of information—coming from both the quantity and quality of data—is not ensured. Inaccurate and insufficient data lead to flawed conclusions. On the hvMuseum, the authors collected many questionable comments when the number of entries was too small in the Oceania region (“There is no yeast used in the Australian region of breads”). Often breads were registered with wrong regions or ingredients, causing distortion of data on the Ingredient Comparison view.

Moreover, the systems are limited when they cannot support students' unhindered experiments. Searching, filtering and relating with tags are essential manipulation features of a data repository. In addition to that, design students can benefit from two types of visualizations, templates (the Matrix view, e.g.) or a blank sketchpad (City Sets Media Player). Templates given by the system can reveal logical relationships between discrete pieces of data that students could not think of, whereas a blank sketchpad let them build connections between data pieces in both systematic and artistic manners.

Limitations and future studies

As multicultural collaboration projects, City Sets workshops and the hvMuseum project presented similar challenges. In order to fulfill the potentials and to compensate for the

limitations mentioned above, City Sets Media Player and the hvMuseum will be developed further in the following directions.

In City Sets workshops, the most obvious challenge was how to foster students' transformative learning process within limited time, with students of different personalities and native languages. In other words, if a group has to invest time in dealing with internal struggles, the work suffers. The success or failure of a transformative learning process may hinge on the facilitator's ability. Overcoming language barrier was a common issue in both projects. In the hvMuseum project, most Internet users volunteered for this study are from English-speaking countries, so the current collection on the hvMuseum is an unbalanced representation of cultures. How to reach out to users from other countries with limited Internet access is still a big challenge.

The hvMuseum site as a participatory data repository has several innate weaknesses pointed out in previous studies: inaccurate information, vandalism of entries by malicious users, and dispute between users (Denning et al., 2005; Kittur et al., 2007). To maintain the accuracy of information, the site currently provides accuracy rating and the right to correct any wrong information for all registered users. The features, nevertheless, are not effective when users are too generous in rating, or not interested in other user's articles. Flagging of wrong information (as an easier form of intervention) or periodic expert content reviews can be alternative solutions.

The limited visualization features in the hvMuseum will be expanded with more options, such as blank templates designed with abstract patterns—Volk and Bloom (2007, p. 34–36)'s 16 meta-patterns observable in various contexts: cycle, web, or layers, just to mention a few—where users can test and document their hypotheses with movable data pieces.

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