Stimulating curiosity for global poverty and inequality

An explorative study of students' experiences with the exhibition *A World at Stake*

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Abstract: *This article focuses on students' experiences with A World at Stake, an interactive exhibition inspired by the United Nations Millennium Development Goals. The research aim of the study was to explore factors contributing to students' curiosity-evoking capacities for global poverty and inequality, with a particular emphasis on experiences of mastery. The research was based on a survey conducted at Glomdalsmuseet in Norway among students aged 9–17 years (n = 1094). The data analysis was performed using quantitative methodology analysis in IBM SPSS version 20. Results indicate that students' interests in social and natural environments, and their sense of responsibility and participation, seem to stimulate curiosity. In particular, students' experiences of mastery in the exhibition are positively associated with their curiosity-evoking capacities.*

Keywords: Mastery, global poverty, science centre pedagogy, curiosity stimulation, quantitative methodology.

In the Global North, global poverty and inequality are recurring issues in newspapers, television broadcasts, curricula textbooks and humanitarian campaigns, yet it is rare to see these issues addressed in science centres and museums. While environmental problems have, to a certain extent, been addressed in Scandinavian museums, Anders Hansen *et al.* argue that the perspective has been almost exclusively locally oriented and with a natural science approach to pollution and consumption

(2014:78). They argue that museums should expand their responsibilities by more actively prioritising global challenges through a social science perspective, a recommendation thoroughly reasoned out in Robert Janes' book, *Museums in a Troubled World* (2009). The recent trends of corporatism and business orientation pose potential threats to museums' attention towards social challenges and environmental problems. Morten Søndergaard and Robert Janes argue, however, that the real

challenge is for museums to find ways to engage in social responsibility without compromising corporate demands (2012).

This article supports the above concerns and presents results from students' experiences with *A World at Stake*, an interactive exhibition jointly developed by the science centres Experimentarium (Denmark) and Jærmuseet (Norway).¹ Global poverty was addressed in *A World at Stake* using the United Nations' (UN's) Millennium Development Goals (MDGs) campaign as inspiration (United Nations 2014).² The MDGs draw on a dualism between developing nations (i.e., poor) on the one hand, and developed nations (i.e., rich) on the other hand (Amin 2006). This almost dichotomous understanding of inequality was incorporated into the design of the exhibition, which took the form of a scaled-up board game. From 2009 to 2014, over 15,000 students and leisure-time visitors experienced *A World at Stake* in Denmark (Experimentarium), Sweden (Teknikens Hus) and Norway (Jærmuseet and Glomdalsmuseet).

In support of the educational ideas of *A World at Stake*, John Falk and his colleagues argue that one of the most valuable contributions of museum visits is to stimulate audiences to learn more (Falk *et al.* 2011, Falk & Dierking 2013). The inspirational and generative aspects of visits are particularly present in science centre pedagogy, where young audiences engage with content in interactive, social and exploratory ways (Witcomb 2011). Importantly, such content is implemented through open-ended tasks, and the process of interaction, where visitors observe the results of their own efforts, is regarded as a key to stimulating curiosity and, hopefully, further learning. This often involves a combination of educational and entertaining features designed to reward young audiences with a feeling of competence and a sense of

mastery, in turn influencing their motivation to know more (Caulton 1998, Falk *et al.* 2004, Falk & Needham 2011).

Science centre pedagogy (and hence also research) is almost exclusively concerned with science literacy and learning (see for example, Stuedahl *et al.* 2014), but an exploratory and curiosity-stimulating approach should also be highly relevant for examining global poverty and inequality. The issue of how to best engage short- and long-term strategies to achieve a more just configuration between developed and developing nations is a frequent subject of scrutiny and debate (Rydin 1999, Lee & Smith 2004, Sterri 2014, United Nations 2014). Because issues such as global poverty and inequality are seldom clear-cut, international communities such as the UN encourage individuals to develop paths to more knowledge, and to use these as principles for achieving long-term goals (Holden 2000). With this background, the current research responds to a need to better understand how museums can engage in global poverty and inequality education through a curiosity-stimulating approach, by exploring the following research question: How are students' curiosity-evoking capacities for global poverty and inequality as addressed in *A World at Stake* associated with their participation and mastery experiences in the exhibition?

In response to this question, I used regression analysis to explore how independent variables such as students' interest, participation, mastery and their backgrounds, is associated with their curiosity-evoking capacities (dependent variable) for global poverty and inequality as addressed in the exhibition. The role of students' participation and mastery experiences is emphasised because the exhibition rests on a theoretical association between participatory mastering experiences and an inclination to

seek more information about poverty and inequality. The study is based on an on-site paper survey conducted at Glomdalsmuseet among students aged 9–17 years ($n = 1094$). The data were analysed using quantitative methodology analysis in IBM SPSS version 20, including principal axis factoring, bivariate correlation and multiple regression analysis.

Curiosity is a short- or long-term drive towards knowledge that one does not yet possess and results from a complicated set of social and cognitive relationships (Loewenstein 1994). No single theory can grasp this complexity. Neither can the current article account for all of the complexities of the causal relationships appearing in the study. My research focus is on the short-term aspects of students' curiosity-evoking capacities. This is theoretically based on George Loewenstein's "specific state curiosity" (1994:77), which understands curiosity as a short-term state and drive towards information suited to fill knowledge gaps realised either implicitly or explicitly.

The article continues with insights into the exhibition experience, emphasising the role of mastery, then outlines theory, previous research, methodology, results, discussion and conclusions.

EXPERIENCING AND MASTERING *A WORLD AT STAKE*

According to Experimentarium, curiosity is stimulated when participants are challenged to a reasonable extent (i.e. when the challenges are neither too hard nor too easy), such that a sense of competence and mastery is facilitated.³ They further argue that the quality of this process is improved when the purpose of the activity is clear, when elements of fun and amazement trigger intensity, and when

the experience is shared in a socially dynamic context.

Each visit to *A World at Stake* was organised as a one-hour event led by a museum educator. Students took part as playing pieces on a surface covering 250 square metres. Each class was divided into four teams. The first 20 minutes were spent informing the students of game rules and how to perform at each location within the exhibition, while the larger questions of global poverty remained implicit. As the educator started the game, the students performed intensely for 20 minutes and 15 seconds (a symbolic reference to the MDGs' 2015 target). The four teams used a centrally placed die that led them to tasks inspired by the MDGs (fig. 1).

All tasks were uniquely designed and challenged students' social, physical, cognitive and strategic capacities in different ways. For example, the task "Who can get to school?" was inspired by MDG 2 (achieve universal primary education), and its design used elements from the children's game hopscotch (fig. 2).⁴

Upon approaching the task seen in figure 2, students needed to rapidly recall the instructions given by the educator on how to perform it, and to agree on who would throw the three coloured (yellow, red and blue) dice near the school desk (social/strategic challenge). One team member announced the numbers on the dice out loud, steering other players to instructive floor panels. The panels represented obstacles to and opportunities for receiving an education, and said, for example, "Wait one turn, you have to look after your siblings and cannot attend school", or "Proceed, your parents can afford a school uniform", or "Move back to start. You have to fetch water from a well 10 kilometres away. You cannot attend school". The team had only five attempts with the dice to complete

Fig. 1. Conceptual illustration of *A World at Stake*. The floor space (250 square metres) is covered with twelve interactive tasks and four team home-bases. Illustration printed with permission from Experimentarium (2009). Designations in the illustration are translated by the author.

the task. After counting their score, students rolled the central die again and were directed to a new challenge with a different theme and design. The time limit made the tasks more difficult by pushing students to perform under pressure and intensity. Text had to be rapidly announced and acted on (physical and cognitive challenge), and consequences had to be quickly interpreted and responded to within the team (cognitive, social and strategic

challenge). Students faced up to eleven other tasks, all inspired by the MDGs and the theme of global poverty and inequality (see fig. 3).

According to Experimentarium's educational principles, mastery in *A World at Stake* is determined by the degree to which students felt they could understand, perform and accomplish the overall challenges laid out for them. An evaluation by Experimentarium, based on qualitative interviews, asked students

Fig. 2. Secondary school students in the process of achieving school attendance and score points for their team as part of the task “Who can get to school?”. A scoreboard can be seen on the right-hand side. Photo: Sigurd Solhaug Nielsen, 2014.

about their experiences of inequality and unfairness in *A World at Stake*.⁵ Some students explained that even though they faced unfair elements while playing, the ultimate point of unfairness concerned poor people in other parts of the world, not students participating in the exhibition. It appeared clear to these students that the purpose of the experience was to focus on the theme of global poverty and inequality in a larger context. Recognising

the purpose of an activity is, according to Experimentarium, an important premise for curiosity stimulation and is closely tied to mastery experiences. In addition, mastery can help students achieve a positive first encounter with the theme of global poverty and inequality and imprint their experience with positive associations, in turn making students more open to questions related to global poverty. See Nielsen & Klein (2015) for

46 a more critical review of representations in *A World at Stake*.

The following section provides a theoretical framework for how the exhibition contributes to the curiosity-evoking capacities of global poverty and inequality.

THEORY

Global awareness – Poverty and unequal access to education, health, shelter and security

Global awareness is a desirable characteristic of future generations. Gibson and colleagues define it as “[...] knowledge of globalisation and the resulting issues and problems that affect us all” (2008:15). Nevzat Soguk argues that “awareness” and a call “[...] for citizens to be attentive to the developments of the world, to be outraged by injustices, and to participate in politics [...]” represent the ethical anchor of the closely related concept of global citizenship (2014:49). As a theoretical concept, global awareness helps us to better address the purpose of *A World at Stake*.

The MDGs advocate equal access to “education, health, shelter, and security” (United Nations 2014) and are promoted by the UN as an alternative set of human rights. To the daily lives of students participating in *A World at Stake*, however, they represent grim contrasts. First, in developing regions, providing primary education and equal access to schools for both genders are some of the keys to combatting poverty. Second, health-related challenges involve reducing the number of deaths among children less than five years of age, improving maternal health via medical support and combatting HIV/AIDS through information and vaccination programs. Third, environmental challenges include access to improved drinking water and sanitation systems. The latter is also vital to combatting defecation out in the open,

which spreads diarrheal diseases and causes a great number of child deaths (United Nations 2014). Deforestation and climate change are also critical issues, as poor people are more vulnerable to environmental changes.

These challenges concern 1,4 billion people, mostly within developing regions and far away from Scandinavian students (United Nations 2013). However, increases in migration from Africa to Europe (including to Norway in 2015) can be witnessed firsthand by students in the Global North, and they can see some of the ways in which we are practically and morally connected across distances and borders. *A World at Stake* is arguably an attempt to confront young students with these inequalities, and to increase their attentiveness to people and conditions across the globe. The purpose and contribution of the exhibition can then be identified as global awareness (Gibson *et al.* 2008, Soguk 2014), achieved through highlighting inequalities (access to education, health, shelter and security), in turn mobilising a sense of duty or obligation to learn more about the challenges of poverty.

Specific state curiosity

Curiosity is a complex phenomenon. Within the psychology discipline, several theories are needed to cover its complexities; however, there is consensus that it stems from a general human need to make sense of one’s environment, and that it is stimulated by both internal and external factors (Berlyne 1954, Renner 2006:306). Loewenstein suggests that differing notions of curiosity can be bridged by a “knowledge gap” perspective, in which curiosity is evoked as a person becomes aware of or focuses on a gap in his or her knowledge, and a feeling of deprivation leads to a need to close that gap: “The curious individual is motivated to obtain the missing information to reduce or eliminate

Fig. 3. The photo shows four teams in action on about half the exhibition layout. A diversity of tasks, themes, and student efforts characterized A World at Stake's approach to global poverty and inequality. Photo: Sigurd Solhaug Nielsen, 2014.

the feeling of deprivation" (Loewenstein 1994:87). This means that information-seeking is not necessarily anticipated by pleasure, but can be motivated by discomfort due to not possessing information, for example, by developing a moral obligation to know more.

The current empirical study is limited to curiosity-evoking capacities and is built on Loewenstein's "specific state curiosity", which he exemplifies as "[...] the scientist's search for the solution to a problem" (1994:77). This describes curiosity as a momentary state and drive towards specific pieces of information suited to fulfil knowledge gaps (i.e., problems). The study concerns curiosity on global poverty and inequality, which include several incremental problems (i.e.,

unequal access to education, health, shelter and security). Such problems may not anticipate a high level of curiosity, as any single piece of information is unlikely to yield a sudden answer and closure of knowledge gaps (Loewenstein 1994:88). However, if filling information gaps is accompanied by a prospect of increasing competence, it is assumed that this may satisfy people's general desire to feel competent, and thus strengthen the level of curiosity (Loewenstein 1994:93). The following section elaborates on mastery and participation as two sources of such competence attainment.

Mastery, participation and interest

The importance of mastery is, according to Albert Bandura, closely related to human

agency. He sees humans as “proactive, aspiring organisms that have a hand in shaping their own lives and the social systems that organize, guide, and regulate the affairs of their society” (Bandura 1997:vii). Self-efficacy, understood as the “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura 1997:3), is in this theorising seen as a vital capability in human motivation and agency. The best source of enhancing efficacy beliefs is enactive mastery, which equates to previous experiences of mastery (Bandura 1997). For these reasons, mastery of *A World at Stake* is important to experiencing control and positive associations among the participating students. They may recall such positive experiences when confronted with the themes later in life.

Participation is an important component of mastery experiences and is understood as students’ collective and collaborative effort in solving problems and challenges faced in the exhibition above “Experiencing and mastering...”. The educational philosopher John Dewey argues that such active collaborative participation processes result in better learning (Dewey 2000), a point highly applicable to museums and science centers (Falk & Storksdieck 2005). In viewing citizens’ political education as a lifelong process, Jane Mansbridge argues that “Participating in [small or large scale] democratic decisions makes many participants better citizens” (Mansbridge 1999:3). Based on these theories, the degree of participation and mastery experiences in *A World at Stake* will likely positively influence students’ curiosity-evoking capacities.

Interest is related to, yet distinct from, the term curiosity. Bandura defines it as “[...] a fascination and a drive towards something” (1986:243). A personal interest in the topics

addressed in the exhibition may contribute to students’ curiosity-evoking capacities.

Previous research – Science centres and curiosity stimulation

With regard to *A World at Stake*, little research, if any, focuses on interactive approaches to global poverty and inequality. Due to a lack of comparable studies, the following reviews research related to museums and curiosity, where most examples concern science centres’ influence on science learning and literacy.

In a Norwegian context, Sverre Nordal’s review of research indicates that student visits to science centres have some influence on attitude, curiosity and interest relating to science (Nordal 2010); Camilla Schreiner *et al.* (2010) offer some empirical support. Although curiosity is seldom explicitly defined as a measurable part of a learning outcome, it is widely discussed by educators as an asset of science centre experiences. Lene Naustdal (2008) demonstrates how differing notions of purpose among students, teachers and the science centres themselves challenge the formal purpose of Norwegian science centres, which is to inspire and motivate their visitors to become curious individuals. Inge Håvard Jore (2010:55) argues that enjoyable and affective experiences in science centres are an indispensable part of knowledge building, as these motivate students to sustain and nurture acquired terms and concepts over a longer term. Falk *et al.* (1998) demonstrate how the degree of learning from engaging experiences depends on visitors’ expectations, and suggests that visitors expecting to be both educated and entertained tend to learn more than those who expect either education or entertainment. Bamberger & Tal (2006) evaluate the balance of educational and entertainment elements in school visits to museums, and find that

visits to museums marked by a clear purpose and a limited number of free-choice activities proved more effective in developing curiosity and interest among students. Falk & Needham conclude that for the local population in Los Angeles, visits to the California Science Center had positive impacts on their attitudes and behaviours towards science and technology learning (2011:9).

METHODOLOGY

Dependent variable “curiosity about global poverty and inequality”

The dependent variable was developed from the tasks in *A World at Stake* and their themes. This resulted in a thirteen-item construct, and reflects solid construct validity (Ringdal 2013) on the theme of global poverty and inequality (Appendix B20/C17-B32/C29). In the survey, students were prompted with questions and responded to a five-point Likert scale (Ringdal 2013:202).⁶ This approach aimed to measure a short-term state of students’ curiosity-evoking capacities, where responses are necessarily influenced by internal and external factors (Loewenstein 1994:77).

Explanatory variables

This study gave priority to nine explanatory variables. This section explains how they were operationalised in the questionnaire, followed by expectations regarding the results. All items and variables are given in the Appendix.

To see whether students’ age mattered significantly for evoking curiosity, item A1 categorised respondents into primary, secondary and upper secondary school levels.

According to Lynnette Zelezny and colleagues, studies have indicated that boys and girls have different attitudes and behaviours towards environmental concerns, with explanations

tending to suggest that girls are socialised to value the needs of others (2000:445–448). A gender category (A2) was applied to see whether boys and girls responded differently to the exhibition’s focus on the needs of poor people.

Significantly, museum visitors are increasingly immigrants or of immigrant descent, with complex yet important consequences for their experiences (Bennett *et al.* 2009:236). The exhibition’s focus on poverty in the Global South emphasised the relevance of students’ experiences of migration and/or multicultural backgrounds. An “immigrant background” item was adopted from the *Norwegian Mock Election Survey* (A3).⁷

A mastery instrument was developed based on “enactive mastery” and “self-efficacy” (Bandura 1997:80). Two items focused on students’ understanding of the instructions and knowing what to do while participating in the exhibition (B1–2/C1–2) and two items (self-efficacy) focused on student’s perceptions of their abilities to recount the exhibition’s content (B3–4/C3–4).

According to Falk & Storksdieck (2005), task performance has proven to affect learning in science centre visits. Participation is measured according to the number of tasks they performed (B8–19/C5–16).

Falk & Dierking (2013) maintain that visitors’ personal context – their prior experience, interest and knowledge – influences their experience of exhibitions in complex yet important ways. The current study measured students’ personal contexts through the following three variables.

First, “environmental behaviour” focused on personal environmental choices in consumer consumption and energy-saving. The idea was developed from Sylke Hallmann *et al.* (2008) and local items were added (C1–C6/D1–D6). Because the exhibition questions students’

awareness, it is reasonable to assume that the respondents' environmental behaviour influences their curiosity.

Second, "interest in natural and social environment" reflects students' general interest in social and natural environments (C7–C10/D7–D10).

Third, "responsibility" focused on student's willingness to pay for humanitarian or environmental causes (Aardal 2007, items C11–C14/D11–D14).

Students' responses to "interest in natural and social environment" and "responsibility" were primarily influenced by prior interest, but also by the exhibition experience.

Design

The design of the study departs from the previously-stated research question:

How are students' curiosity-evoking capacities for global poverty and inequality as addressed in *A World at Stake* associated with their participation and mastery experiences in the exhibition?

This question is explored in a large sample of visitors using a cross-sectional research design (Ringdal 2013). The design represented a contemporary case study in which participants represented individual cases. A pre- and post-test design was not viable due to unpredictable numbers of visitors to the museum. A randomised control trial was considered but rejected because it is considered unsuitable for assessing a complex set of variables in a non-controlled environment (Kisiel & Anderson 2010:188).

Sampling and survey administration

According to the host museums, *A World at Stake* successfully targeted students from primary, secondary and upper secondary schools. For this reason, the sample included

all organised school visits. Participants were recruited by informing and inviting pre-booked school groups prior to their visits. All participants (pilot and main study) were informed of the purpose of the research, and voluntary aspects were emphasised prior to execution. 72 per cent of the classes were surveyed on-site, with paper questionnaires administered by the researcher or a dedicated educational staff member from Glomdalsmuseet; 28 per cent were surveyed at school within one week of their visit. The pilot survey was conducted from January to April 2014 (n = 483). Test analyses were performed and slight modifications were made to the questionnaire prior to execution of the main survey in May–June 2014 (n = 612). The pilot and main study had different and uneven distributions of age groups. In order to achieve a more even distribution, identical survey items from the two samples were combined, resulting in a sample of 1049. The response rate was more than 95 per cent. The sample comprised 49,3 per cent girls and 49,2 per cent boys (1,5 per cent missing). The age levels represented Grades 3–4 (1,3 per cent), 5–7 (73,1 per cent), 8–10 (17,9 per cent) and upper secondary school (6 per cent) (i.e. 1,6 per cent missing). This distribution reflects visiting classes at the time the survey was administered. It was not viable to obtain a representative sample covering all visitors to the exhibition. Thus, the sample has limited generalizability.

Processing and analytical procedures

The scanning procedure for the questionnaires was monitored by the author at a research institution, with support from IT personnel (Faculty of Social Sciences and Technology Management, NTNU). Electronically unidentifiable responses were determined

manually. Distributions of items were checked for skewness and kurtosis; all items except “mastery” were lower than two (Ringdal 2013). Although its kurtosis value was 3.18, the decision was made to keep the items because a high mastery level in the exhibition is expected and desirable. Missing values ranged from 1–3 per cent. These were not replaced and only valid responses were used. Construct validity was performed on the variables “mastery”, “curiosity”, “environmental behaviour”, “responsibility” and “interest in social and natural environments”. A semi-confirmatory factor analysis was performed using IBM SPSS software version 20, principal axis factoring with maximum restrictions, only conceptual items, specified one factor and non-rotation, and items’ total explained variance factor as measures of the model’s fit. The variable “environmental behaviour” resulted in a two-factor solution, corresponding to “consumer consciousness” and “environmental choice”. The factor loadings and Chronbach’s alpha (α) are reported in the Appendix. The subsequent analytical procedure followed the principle of parsimony, where the purpose is to explain maximum variation with the simplest model possible (reduced complexity model). First, bivariate correlations of all variables were studied using Pearson’s correlation coefficient (r). Second, significantly correlated variables were then applied in a multiple regression analysis. A second regression included only significant explanatory variables in a final regression model.

RESULTS

The results of the analytical procedure are listed in Table 1. Pearson’s r was used to determine bivariate correlations (two-way correlations). In the regression analysis, the standard coefficient

beta (β) was used to determine the relationship between the explanatory variables and the dependent variable “curiosity”. These figures report the unique effects of the explanatory variables (by controlling for the effects of other variables). In the first regression model (Table 1, middle column), 36 per cent of the variance was explained ($R^2 = .36$). The second regression represented a reduced complexity model and explained 37 per cent of the variance ($R^2 = .37$), which is substantial.

In Table 1, the variable “age level” proved non-significant in a bivariate correlation. This may suggest that the exhibition’s contribution to curiosity was not dependent on the participant’s age, which is in accordance with host institutions’ experiences that *A World at Stake* communicated well across a large range of ages. In line with previous research (Zelezny *et al.* 2000), girls proved slightly more curious than boys (low values refer to the female category). The variable “immigrant background” proved not to be significant in bivariate correlations, indicating that the experience of migration or of having an immigrant background were not influential factors in stimulating curiosity.

“Mastery” displayed a medium level of bivariate correlation ($r = -.24$) (low value represents a high level of mastery). In the second regression model, $\beta = -.13$, which is a low-medium unique score, controlled for other independent variables. An intense and exciting but short visit may not result in a large contribution. A mean value of 1.68 (on a scale of 1–5) indicated that many participants experienced a high level of mastery. Due to the high level of skewness for this variable, the estimates may be considered conservative. Thus, it is likely that good experiences of mastery in the exhibition contribute positively to curiosity. This is discussed below.

	Bivariate correlation		First regression		Second regression (reduced complexity model)	
Explanatory variables	Pearson's correlation (r)	Sig.	Std. coefficient β	Sig. two-tailed	Std. coefficient β	Sig. two-tailed
Age level (A1)	-.031	.327				
Gender (A2)	-.126	.000	-.082	.004	-.083	.002
Immigrant background (A3)	-.006	.859				
Mastery (B1-4, C1-4)	-.242	.000	-.126	.000	-.134	.000
Participation (B8-19, C5-16)	.094	.004	.072	.009	.073	.007
Consumer consciousness (C1,C2, C6, D1, D2, D6)	.245	.000	-.007	.810		
Environmental choice (C3, C4, D3, D4)	.238	.000	.004	.897		
Interest in social and natural environments (C7-C10, D7-D10)	.551	.000	.430	.000	.428	.000
Responsibility (C11-14, D11-14)	.442	.000	.177	.000	.178	.000

Table 1. Results of the analytical procedure with "Curiosity" as dependent variable.

"Participation" in the exhibition yielded a minimal bivariate correlation ($r = .09$). In the second regression, $\beta = .07$, suggesting that curiosity depended to a small degree on how many tasks the students performed in *A World at Stake*.

"Consumer consciousness" proved a weak level of bivariate correlation ($r = .25$), which was not significant in the first regression model. The result indicates that students with consumer consciousness were not necessarily

more inclined to become curious about the topics in *A World at Stake*.

Similarly, "environmental choice" displayed a weak bivariate correlation level ($r = .24$). The variable was not significant in the first regression model. This may indicate that individuals making everyday choices about environmental concerns are not necessarily more likely to have their curiosity stimulated by the exhibition.

"Interest in social and natural environments" displayed a strong bivariate correlation ($r =$

.55). The second regression displayed unique effects, $\beta = .43$, and suggests that personal interest in related issues from a national or international perspective is important for the exhibition's contribution to curiosity.

"Responsibility" displayed a strong bivariate correlation level ($r = .44$). When effects from other variables were controlled for, the second regression $\beta = .18$. This indicates that students' sense of responsibility contributed positively to curiosity.

DISCUSSION

While there is a common assertion that hands-on interactive exhibits in museums and science centres foster engagement and experiences of mastery (Witcomb 2011), there has been a lack of empirical evidence to demonstrate whether or how this may stimulate curiosity. The current study provides empirical evidence to support the contribution of mastery to students' curiosity-evoking capacities for global poverty and inequality. Based on 1094 participants, "mastery" seems to have important low-medium effects ($\beta = .13$) and represents a significant and unique contribution to students' curiosity-evoking capacities. The following discussion offers some explanations for this result by focusing mainly on aspects of mastery in the exhibition experience and some associations with curiosity.

First, the museum educator's instructions focused on what to do where in the exhibition, ensuring that students got an easy and understandable start to the challenges facing them. By exerting a reasonable amount of intellectual, collaborative and physical effort, students experienced that education, health, shelter and security are privileges. They are not readily available to everyone and can be hard to acquire in developing countries. The

exhibition also allowed engagement of a wide range of skills and competences, meaning that participants could, to a high degree, define individual ways of engagement and still handle the challenges that lay ahead. Although some of these involved experiences of unfairness during game play, some students identified this as a reflection of the world of inequality outside the exhibition (see footnote 5). This kind of recognition of purpose is important for mastery experiences and hence for curiosity. Second, the students felt able to recount details of the experience to friends and family (self-efficacy). Students' ability to reproduce content in different contexts is likely an important step to becoming aware of knowledge gaps and further enquiries (curiosity).

A preliminary conclusion is that these elements of mastery may have contributed to positive associations between participation and the thematic issues found within it. These associations can, in turn, contribute positively to students' implicit or explicit recognition of knowledge gaps, and to a need to close these gaps. The need (or curiosity) for more information is not necessarily characterised by an anticipation of pleasure from obtaining it (Loewenstein 1994). *A World at Stake* was arguably designed to spur global awareness in a world of inequality; any derived curiosity was likely characterised by feelings of duty or obligation to know more, rather than by enthusiasm and excitement. However, curiosity is not necessarily a persistent phenomenon, and it should not be assumed without further evidence that mastery in this exhibition contributes to any sustained level of curiosity about global poverty and development.

A few comments on mastery in relation to other contributory factors may be pertinent. Despite the fact that the variable "interest in social and natural environments" in addition to

54 “responsibility” contributed more to curiosity, the effects of “mastery” remained significant in the second regression and of low-medium importance throughout the analysis. Hence, the current result represents a critical test of the mastery variable. Another finding is that neither “consumer consciousness” nor “environmental behaviour” contributed significantly to “curiosity”. These two dimensions probed students’ past actions as opposed to the more abstract variables “interest in social and natural environments” and “responsibility”. One might expect that students acting with a high level of consciousness of environmental factors – for example by sorting refuse or seeking products labelled “ecofriendly” – were also inclined to develop curiosity about global poverty and inequality, but the current study indicates otherwise. Interestingly, mastery was more important than these characteristics from the students’ personal context (Falk & Dierking 2013), and supports the theory that students are subsequently inclined to assess the theme more positively.

Considering the empirical results on the whole, *A World at Stake* seems to offer a positive encounter (mastery) with the theme of global poverty and inequality. Considering the scale of the inequalities, society needs students to develop global awareness and curiosity about these issues (Gibson *et al.* 2008, Soguk 2014, Sterri 2014). The kind of engagement seen in this exhibition is indicative for a museum’s promise to aspire its public towards a common good. The conceptual framework in *A World at Stake* and its ability to facilitate intensified interactive participation may also serve as an example of how museums can engage in serious social concerns on a global level without compromising corporate demands, as encouraged by Søndergaard & Janes (2012).

CONCLUSIONS

The study found that mastery had a low-medium unique effect on the development of curiosity. The science centre pedagogy implemented in *A World at Stake* seems to have supported both self-efficacy and enactive mastery experiences, in turn contributing to the curiosity-evoking capacities of global poverty and inequality. The variable “interest in natural and social environment” appeared to have the largest contribution to curiosity. This was considered as part of the students’ personal context (Falk & Dierking 2013), but inspiration from the exhibition experience should not be ignored. “Responsibility” showed a low-medium level contribution to curiosity. A tendency for the students to care about concerns outside their close environment seems to have contributed to their curiosity, and this tendency might have been strengthened by the exhibition experience. Girls seemed to be more inclined to develop curiosity, but not to a high degree. Students’ levels of participation had a small effect on the stimulation of curiosity.

Some of the students’ experiences discussed in this article provide some support for Experimentarium’s idea that mastery can evoke curiosity, at least in the short term. More specifically, the types of engagement witnessed in *A World at Stake* seem to have the potential for mobilising students’ motivation to fill knowledge gaps regarding global poverty and inequality. But whether and how students benefitted from *A World at Stake* over time, and whether and how students will apply their experiences to new contexts, remain highly uncertain.

LIMITATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

Strictly speaking, the results are only repre-

sentative of the study sample. One weakness might have been the sample's domination by one age group. This was due to the fact that the composition of visiting schools could not be predicted and the survey needed to facilitate respondents of different ages. For much the same reason, pre- and post-tests were not designed and implemented. While a comparative perspective might have provided interesting results, it would still have had to deal with unpredictable sampling, and with the vital challenge that curiosity often appears as a short-term phenomenon and not necessarily as a persistent state. Hence, the insights gained from the study concern the stimulation of curiosity over a short time frame, measured shortly after the exhibition experience. However, the sample was large, and there are reasons to believe that similar findings might be observed in other samples.

With these limitations in mind, the findings arguably represent an important foundation for future studies. First, more research is needed to understand the potential of exploratory and curiosity-stimulating approaches to fields other than natural science literacy and learning. Such understandings could help a wider range of museums to develop attractive ways to engage in contemporary social issues, which remains a vital museological concern. Second, there seems to be a deficit in the use of quantitative methodologies in museum research. Visitor studies in particular could be strengthened through increased adherence to established quantitative research traditions.

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NOTES

1. Experimentarium had a 75 per cent share of the project and is therefore addressed as the curating institution. The project received financial support from DANIDA (Ministry of Foreign Affairs of Denmark) and NORAD (Norwegian Agency for Development Cooperation).
2. The eight MDGs are the UN's strategy to "[...] eradicate extreme poverty and hunger" within 2015 (goal 1). The other seven goals are means to achieve the first goal: "2. Achieve universal primary education, 3. Promote gender equality, 4. Reduce child mortality, 5. Improve maternal health, 6. Combat HIV/AIDS, malaria, and other diseases, 7. Ensure environmental sustainability, 8. Develop a global partnership for development".
3. Seminar lecture held by Asger Høeg (former director of Experimentarium), 23 January 2013.
4. The adaptation of game concepts is referred to in Experimentarium's project document "En verden på spil" (last updated 12 January 2009).
5. Unpublished evaluation report, "Evalueringsrapport af undervisningsforløpet En Verden på Spil" by Kristoffer Grønbeck and Karina Goyle (Experimentarium 2010).
6. In the printed questionnaire, only extreme values of the scale were prompted: 1 = Less curious (veldig lite nysgjerrig) and 5 = very curious (veldig nysgjerrig).
7. *Norwegian Mock Election Survey* (Skolevalgundersøkelsen) is a biannual standardised survey by Norwegian Social Science Data Services (NSD), mapping students' political orientation prior to elections in Norway. Immigrant background is defined by Statistics Norway (SSB) as immigrants and Norwegian-born to immigrant parents.

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APPENDIX

<i>Survey items</i>						
Pilot study	Main study	Item title	Factor loadings	Explained variance	Chronbach's alpha	Construct
Part A	Part A	About you				
A1	A1	Your class level				Age level
A2	A2	Gender				Gender
A3	A3	Do you have immigrant background?				Immigrant background
Part B	Part C	Your experience of A World at Stake				
		How well do you feel you and your group mastered A World at Stake?		39.20%	0.714	Mastery
B1	C1	Before we started playing I understood most things explained to us by the arbiter from the museum	0.61			
B2	C2	When my team started playing we knew what to do for each task	0.527			
B3	C3	If anybody were to ask, I could explain the game rules of A World at Stake	0.708			
B4	C4	I remember most tasks we performed and can recount them when I get home	0.647			
		What tasks did your group perform in the game?				Participation
B8	C5	Stop the epidemic (Push buttons on the world map)				
B9	C6	Plant a tree (1–3 forests in one minute)				
B10	C7	Water to the hospital (Who should not have water?)				
B11	C8	Where does the poop go? (In the sewer or on the street?)				
B12	C9	Africa quiz (Map of Africa with questions)				
B13	C10	Who gets access to school? (Throw 3 dice used to decide)				
B14	C11	Catch the food (Wind funnel)				
B15	C12	How old do you become? (The coffin)				
B16	C13	Catch food for your family? (The freezer and the refuse bin)				
B17	C14	Get a doctor (Quoits game)				
B18	C15	Save the children (Food, medicine, or care?)				
B19	C16	When the earth shakes (The earthquake game)				
		Think back to your experience of A World at Stake. You encountered the following questions in some way or another. How curious are you about each of them?		40.00%	0.893	Curiosity
B20	C17	How do diseases spread around the world?	0.584			
B21	C18	How can pure water save ill people?	0.681			
B22	C19	What happens to the sewers in places without toilets and sewage treatment plants?	0.463			

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B23	C20	How can planting forests improve people's livelihoods?	0.54			
B24	C21	How do children and youths in Africa live their lives?	0.65			
B25	C22	Can we live from food we find in refuses?	0.55			
B26	C23	How can more boys and girls gain access to school and education?	0.665			
B27	C24	Why do many people die early in poor countries?	0.648			
B28	C25	How do poor people obtain food?	0.682			
B29	C26	How can we reduce the number of poor people in the world?	0.712			
B30	C27	How can ill people not living close to medical facilities receive help?	0.712			
B31	C28	How can we save more children in the world?	0.745			
B32	C29	How can more people survive floods, storms and earthquakes?	0.633			
Part C	Part D	Your interests concerning nature and people				
		What do you do out of consideration for the natural environment or for other people?				
		Confirmed factor: Consumer consciousness		60.70%	0.675	Consumer consciousness (environmental behaviour)
C1	D1	I look for products that are ecofriendly or labelled Fairtrade	0.779			
C2	D2	I check which country my clothes were made in	0.771			
C6	D6	I check which country my food originates from	0.786			
		Confirmed factor: Environmental choice		70.20 %	0.576	Environmental choice (environmental behaviour)
C3	D3	I sort refuse	0.838			
C4	D4	I turn off lights to save energy	0.838			
		On a scale from 1 to 5, how interested are you in ...		50.50%	0.798	Interest in social and natural environment
C7	D7	nature and environmental protection in Norway?	0.666			
C8	D8	the welfare of people in Norway?	0.605			
C9	D9	nature and environmental protection in other countries?	0.841			
C10	D10	the welfare of people in other countries?	0.71			
		On a scale from 1 to 5, what is your willingness to pay for ...		49.70%	0.793	Responsibility
C11	D11	a cause helping people in Norway?	0.558			
C12	D12	a cause helping people in other parts of the world?	0.725			
C13	D13	a cause for environmental protection in Norway	0.708			
C14	D14	a cause for environmental protection in other parts of the world?	0.807			