V Factor: Volunteers as a bridge between museum scientists and the public

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Abstract

V Factor is a new programme at the Natural History Museum in London. It offers volunteers the chance to work in public view alongside Museum scientists on collection-based research and curation projects, taking them from visitor to proactive volunteer. It aims to involve a volunteers project manager, scientists, curators, volunteers and the public in the museum's research. Volunteers work alongside scientists on a research project whilst benefiting from a unique, informal and fun learning experience. Visitors are able to observe the processing of samples and interact with those involved. The management of this volunteer programme is described in this paper. The pilot project was 'Throughflow'; an international study of South-east Asian fossil corals as a means to describe the high biodiversity of their ecosystem and the effects of environmental change. Volunteers have successfully assisted with the cleaning of specimens so that they may be curated. At the same time, they have been discussing with experts project-related information, collections care, and the role of museums today. The programme has been continuously evaluated and changed as felt necessary. By March 2013, 45 volunteers were involved. Outcomes have included improved volunteer talent and education management, excellent assistance with scientific work and novel means of attracting the public to the museum's work.

Keywords: Volunteers; Science; Museum Education; Natural History Museum, Darwin Centre

Introduction

Although scientific research is an important function of the Natural History Museum in London (NHM), and the museum employs over 300 scientists, most visitors have only a limited knowledge of its contributions to science. This is unfortunate, as with knowledge comes an understanding of the nature of scientific work, its impact on our daily lives and how it can best be supported. One of the purposes of the new Darwin Centre (DC2) is to showcase the science undertaken at the NHM. Within DC2 is a Specimen Preparation Area (SPA), where scientific activities can be observed through a large glass window by visitors. In 2012 a new programme 'V Factor' was established in the SPA (Figs. 1 & 2).

The project aimed to increase the use of this area as well as a way of informing the public about the scientific work carried out at the NHM. The project also aimed to provide opportunities for volunteers to engage in research projects, whilst also educating them about working in museums and assisting in essential projects for the museum science teams (the 'V Factor Programme'). In this publication we present the development, application and evaluation of this programme. The publication has been put together by members of staff and present or previous volunteers of the Natural History Museum. It is hoped that the information provided here will be a useful model for other museums.

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Fig 1. The SPA area of DC2 in the Natural History Museum with volunteers working to clean fossil corals. As seen from inside the SPA (Photo: A.T.)

Fig 2. The SPA area of DC2 in the Natural History Museum with volunteers working to clean fossil corals. A visitor's view from outside the SPA (Photo: A.T.)

Previous studies on museums and their roles in communicating science

Elliott (1929) noted that educational opportunities are available for adults in museums, but also questioned whether and how they were being used. He noted that adults seek both education and enjoyment from museums, and it should be the role of the museum to aid them in their quest. Taylor (1942: 146) wrote that:

> *'Our role is not to feed…temporary excitements or to dish up ephemeral and inconsequential exhibitions- Our responsibility is to integrate what the man in the street has learned with what he has to face in the future.'*

More recent publications such as *Museums and the Education of Adults* (Chadwick & Stannett, eds,1995), 'Nonformal and Informal Adult Learning in Museums: A Literature Review' (Dudzinska-Przesmitzki, 2008), and 'Museums as Sites of Adult Learning' (Grenier, 2010) have explored the role that adult education in museums can play in creating a learning society, using nonformal and informal approaches. Grenier (2010) explores how museums can act as 'dynamic agents of cultural dissemination', so that adults can 'experience the unknown, revisit the familiar, stimulate their curiosity, and challenge their existing beliefs'. This allows people to test, confirm or modify their ideas; their understanding can be increased, providing opportunities to share in conversations, discussions, debates, and social interactions.

A recent demonstration of the value of museums in adult education is reported by Carney *et al* (2009). Using a large sample, these researchers have demonstrated that community-based museums, partnered with academic institutions, can inform the public for example about health research. McPherson (2006) reinforces the view that in the future museums will continue to preserve and provide recreation, but also to educate.

In the UK, a government programme aimed at raising the standards of educational work in museums, the UK Education Challenge Fund project 'Seeing the museum through visitors' eyes', has been evaluated by Hooper-Greenhill & Dodd (2002). The programme included over 400 projects. Although it was assumed that most museums already had included formal, informal and lifelong learning in their remit, it was hoped that an exchange of ideas would improve their provision. The authors say:

> *'The impact of involvement with museums and galleries is potentially rich, diverse and multiple. Participation in museum projects has encouraged higher and more focused aspirations, increased feelings of confidence, self-worth and personal identity, has led to the development of skills and increased employability, and broadened knowledge and awareness of cultural institutions. While these outcomes are difficult to measure in the statistical sense, they give a clear sense of the character of the social impact that museums can achieve.'*
>
> (Hooper-Greenhill & Dodd, 2002: 22)

As a result of the programme, it was found that staff gained knowledge about the value of museums in education and how staff could develop more educational roles. Hooper-Greenhill & Dodd (2002) are hopeful that the enthusiasm associated with this project, together with realistic, focused, strategic

objectives and clear evaluations, will allow museum educational capacities to improve even further in the future.

Engaging adult audiences

Questions about how and why adults attend museums and how and why they benefit from their experiences continually need to be asked. Black (2005) describes the challenge to understand the nature, motivation, and expectations of visitors and how to retain them; the issue is always how to engage the visitor. Ross (2004) describes a new museology, where museums have displays/ exhibitions acting as catalysts for learning for a wide public, involving a paradigm shift, from display towards education. Pearce (1994) stresses the need for interpretation, rather than simple collecting. According to Silverman (2010), museums and their contents elicit introspection as well as cognitive responses. Visitors can engage in meaning-making and self-exploration, while exploring, contemplating and discussing what they see. For visitors, but more especially for volunteers, there are opportunities to build competence and capabilities in communication and work. And as Golding (2009) maintains, museums are also now places where new identities are formed and individuals from many different groups can make connections. She believes that museums can tackle societal problems such as injustice and exclusion.

The role of museums in communicating science has also been discussed (Rader & Cain, 2008). The NHM contains over 70 million specimens and the number continues to grow as museum researchers collect to address old and new questions. Access to the collections is mainly through curators – and the importance of the collections cannot be overestimated. For example, Johnson *et al* (2011) have recently written about how historical and collections can be used to inform debates on the impact of anthropogenic environmental change on the biosphere. Historical collections can provide useful baseline data when modelling past and present ecosystems and adaptation to change. This follows on from the writings of Janes (2009) on the role of museums in a troubled world and the urgency of curatorial work. Rader and Cain (2008) have noted how science museums today are involved with government policy and public culture as well as science. Public participation in a museum's work can improve public involvement and engagement with science, to empower the public towards an understanding of the natural world. Science museums now aim to show real phenomena and provide real experiences in enjoyable, unstructured social settings, while providing props (their unique selling points; the collections) which are unlikely to be available elsewhere.

There then follows the question of how to involve museum visitors in scientific exploration, to make sense of what they are experiencing; they often cannot seem to make the expected links and/or are reluctant to ask for assistance. Carney *et al* (2009) compared direct versus indirect visitor interactions with medical researchers in a museum and found, surprisingly, that the public appeared to prefer a permanent, unstaffed programme, as they were somewhat reluctant to speak with experts. Whether this was due to the public themselves or to the fact that the experts did not have the skills to interact is not known. How the public can be encouraged to speak with scientists was considered to be problematic.

Another programme, involving the NHM, together with other UK and US museums, was set up to improve public engagement with science ('PEST') (Lehr *et al,* 2007). Here 'dialogue events', adult-focused, face-to-face forums for scientific experts to meet with the public were set up to discuss policy. They intended to move museums from didactic education to constructivism, where the learner is an active participant in his/her learning. These dialogue events included public participation directly in scientific and technical decision-making and the promotion of broad interactions between the public, experts, and policy-makers. One important question is how to attract less forthcoming participants to such events.

The journal '*Museum and Society'* has devoted an entire issue (July 2011) towards **'**Hot Science Global Citizens: The Agency of the Museum Sector in Climate Change Interventions'. A variety of topics were openly discussed, including examining if museums are trying too hard to have something for everyone (Dibley, 2011), what a hostile review of an exhibition does in a museum (Hodge, 2011), and whether museums can act as cultural brokers concerning climate change (Salazar, 2011) are discussed. Cameron (2011), the editor of the issue, deals with current topics such as cultural governance and deliberative democracy for example towards climate change. It is of importance for institutions such as museums to consider audiences as moral and responsible citizens, and also as actors who can influence governments.

Getting the public interested in science can be problematic. Freedman *et al* (2010) have addressed this topic in their work on creating natural history events in Plymouth that are accessible and of interest for all the family. The role of the family, and parental interest, in promoting science careers is part of a STEM research programme being carried out by UK researchers (Archer, 2013). One recent approach is to include science in traditionally non-scientific museum exhibits (Copley, 2010). Copley (2010) assessed the scientific content in UK archaeology museums, both in character and extent, and the attitudes of the curators (those preparing exhibits) towards scientific content in their displays. Scientific explanations were reported as welcome if they are in accessible, in everyday language, with little detail of techniques. Obstacles mentioned were lack of space and/or funds and/or visitor interest.

Visible scientists

Another way of approaching science in museums is to have laboratories visible to the public. Meyer (2011) has recently reviewed this subject. In these laboratories, scientists carry out research, interact with the public, provide demonstrations and present their work. In this way, museums become places where the public can encounter 'research in the making' and can also discuss the needs, risks and ethics of scientific research. DC2 at the NHM is mentioned, where the public can view labs and collection storage through glass windows. Displays thus move from providing answers to allowing questions. These are important and interesting models, because all the work that goes on behind the scenes from conservation of specimens to digitising and creating online databases is not ordinarily seen by the public.

The challenges presented in using open laboratories include the potential downside of researchers who are 'on display' having to deal with noise and disturbance to their work. There may also be problems concerning safety. Meyer (2011) states that it is not always easy to recruit researchers and other specialists to work in public view; also, the researchers need to learn how to communicate their work to a wide audience of lay people. In addition, the vast majority of a researcher's time is spent on activities that do not look especially interesting (for example reading and writing papers or emails) nor can be easily displayed (for example, field work) so thought has to be put into what can actually be done in public view. But with field work, or new donations, new collections can be cleaned, prepared, sorted, and catalogued. Meyer (2011: 267-268) recommends ecology as a:

> *'…fruitful starting point for visitors to reflect upon socio-economic and environmental problems and issues of sustainability, and therefore help them to become more engaged and critical citizens'.*

The visitor and the volunteer

There are two principal groups of adults who attend museums and can benefit from contact with museum staff: visitors and volunteers. The role of volunteers as intermediaries or bridges between scientific experts and the general public has not been clearly examined. Most museums do have significant numbers of volunteers; the NHM can have up to 400 at any one time in the year. Some work behind the scenes with the scientists, others work with the public. People volunteer for a number of reasons (Wilson, 2000), but many wish to develop confidence, capabilities and competence, so that they can move further along in their lives. Silverman (2010) writes about the desire to acquire skills, and how museums can help volunteers gain and improve many abilities by providing unique vocational experiences. Internships, volunteer and employment opportunities in museums help adults develop their competencies, knowledge and abilities. Volunteering can serve as an important step towards employment, while also offering social opportunities and satisfying altruistic desires.

The management of volunteer programmes is seen to be critical. As Wilson (2000) states, people usually do not contribute goods and services to others unless there is some reward or profit involved, for example, recognition of their efforts. They may also enjoy the socialising aspects of volunteering – with staff, other volunteers and the public. The volunteering can be a learning experience, making up for what they see as a deficiency of learning experiences in their lives, or just to give something back to society. With respect to science, and more specifically the natural world of coral reefs, Stepath (2000) discusses the need for members of the community (volunteers) to become aware of the problems being faced. But this author also emphasizes how important it is to move from awareness into participatory action, and if volunteer participation is to be useful and meaningful, it must be well managed. Jordan *et al* (2011) have described how 'citizen science' (i.e. volunteer) programmes vary in their effectiveness, largely dependent on giving consideration to how people learn and their goals, as well as the goals of the scientific endeavour.

In addition to increased knowledge of science, volunteering in a museum setting can improve other competencies. Mixing of volunteers from different backgrounds can enhance their learning. For example, Reser & Bentrupperbäumer (2000) note how useful it can be for natural scientists to work together with social scientists; thus skills relevant for both disciplines can develop. When volunteers spend time speaking and working with experts and other volunteers and explaining objects and phenomena to the general public, they are developing competencies and confidence in many spheres.

Wilson (2000) lists life satisfaction, self-esteem, self-rated health, educational and occupational achievement, and functional ability as just some of the personal positive effects of volunteering. According to Silverman (2010) museums are important for society as a whole by contributing to self identity, by fostering stability and by providing support for change. Thus volunteers in a museum with natural science collections appear to be perfectly placed to serve as intermediaries between scientific experts and the general public.

The new V Factor programme at the NHM has been developed to improve links between scientists and visitors, using proactive volunteers as the vehicle. Following discussions with the Museum staff and observations of volunteer interactions with the public at the Museum of London in March 2009, it was decided to commence on this new scheme at the NHM. Using the large bank of available volunteers together with the expertise of staff in the NHM Organisational Development Department, the volunteers project manager began to develop a learning programme for staff, volunteers and museum

which was used in the development, results of the scheme and an evaluation of its success.

How the V Factor programme was put together
In 2009, the NHM opened the DC2, which is now home to many scientists. Opening up their work to the public is a principal aim of V Factor. Through establishing V Factor we aimed to raise awareness of museum science and the profile of the NHM as a research centre; the NHM is both a national (and international) visitor attraction and a scientific study centre. However, only a small proportion of the collections are on display to the public so the research and curatorial aspects are often not obvious to visitors.

We also intended to set up a programme for all involved. There have been, and continue to be many volunteers working successfully behind the scenes, but in the main they work intimately with scientific staff. The new programme had to instil confidence in the science staff that their work would benefit from the programme. It also had to produce benefits for the participating volunteers and for visitors to the NHM.

Another aim was to increase visitor number and diversity. The Specimen Preparation Area (SPA) within the 'Cocoon' in DC2 was designed so that visitors could see scientists at work. Unfortunately, the area was not being used to maximum effect. The aim was to make the space function for extended periods of time and to create an atmosphere where the public could observe and engage with real science. Visitors range from small children to adult groups, from the UK and abroad, but all can be helped to understand what is going on in the space and what the benefits of the scientific endeavours might be.

We intended to provide engaging, inclusive and fun volunteer opportunities. Most of the opportunities for volunteering at the Museum are very selective. The V factor programme was and is aimed to provide a more inclusive programme and increase the diversity of our volunteers. In this way many members of the public could become more knowledgeable about the Museum's work and, as a result, hopefully become supportive of it. In addition, V factor volunteers could potentially transfer to other work in the Museum.

Finally, we hoped to increase public understanding of the importance of museums, our science, the roles of curators and other employees. V Factor challenges participants to consider the role of museums today. Through the programme we hoped to inspire new people into the heritage sector and into our talent pool for jobs/opportunities.

Principal participants
In addition to the general support from NHM staff and volunteers, there was a special group of participants who focussed on the V factor programme. These included the volunteers project manager (VPM) who initiated and developed the scheme, and provides ongoing management required for the successful continuation of the programme; the scientists directing the research programmes involved in V factor: in the first instance, the 'Throughflow' project involved with fossil corals from Indonesia; researchers working with the 'Throughflow' project to acquire collections from the field and gather new scientific evidence; a member of the NHM Department of Earth Sciences collection team (a 'curator') with the role of supporting the volunteers while still carrying out curatorial duties; volunteer leaders to assist the collections specialist ('curator'), help the other volunteers and engage (inform) the visiting public; volunteers who agree to attend the Museum one day a week for 10 weeks; volunteer evaluators who monitored the project and produced documentation about how it was/is progressing; and visitors who engage with the volunteer leaders and observe the volunteers working together with the curator and volunteer leaders.

Sequence of events
The programme was initiated following consultation with many different experts across the Museum (both volunteers and staff) to make V Factor truly a cross departmental collaboration. Issues such as funding, risk assessments, pest control, recruitment, programme design needed to be resolved. Experts outside the Museum (e.g., Museum of London volunteer leaders) were also consulted and provided invaluable assistance.

The impetus for starting the scheme was the arrival from East Kalimantan (Indonesia) several tonnes of rock containing fossil corals and other marine invertebrates which resulted from large-scale field expeditions; these samples needed to be processed in a short period of time and thus provided the perfect pilot study for the programme. The principal scientist from the 'Throughflow' project asked for assistance and was referred to the volunteers project manager. In addition, there was a strong desire on the part of the NHM to improve the public's knowledge of its research and curation activities and the level of inclusivity within the volunteer programme.

The first group of individuals trained were those intending to become volunteer leaders. Topics included in the training covered a general understanding of the aims of the 'Throughflow' project, coral biology and palaeontology, curation, the history and present organisation of the NHM, integrated pest management, basic visitor operations, health and safety, as well as how best to prepare the specimens for observation. Fieldwork planning was also included as one of the topics, with the aim of providing a feel of fieldwork and highlighting the importance of planning in any field-based science project. Standard teaching methods such as ice breakers/energisers, analysis of known and unknown samples, quizzes, etc, were used in the training. The training covered in detail how to work with the rock samples and hold the specimens, so that the fossil corals could be clearly observed.

Recruitment of subsequent volunteers was through a simple sign up process, an expression of interest form available on the NHM Website or to be picked up on site. Social media and the local authority volunteer centre were also used to advertise for volunteers. Volunteers were informed that they were expected to allocate one day per week for 10 weeks to the project.

The volunteers' practical task was principally to process fossil corals each week through the unpacking, washing, sieving and labelling of Indonesian fossil corals. In addition to these practical skills the programme included activities and discussions each week based on the following topics:-

Week 1: Volunteer induction, setting up the work station, how to process fossil corals, key do's and don'ts, collection care techniques.

Week 2: What is a fossil, how are they formed and where can they be found? Why we collect natural history specimens.

Week 3: Why coral reefs are important. Why we curate collections, why collections are important.

Week 4: Ten top tips for communicating science, the importance of education in museums and informal science communication.

Week 5: A brief history of the NHM, overview of our collections, outline of various roles/sections within the NHM (visitor attraction & scientific research centre).

Week 6: Collecting and processing. The steps from the field to the lab, using 'Throughflow' as a case study. A deeper understanding of 'Throughflow'.

Week 7: Deeper understanding of underwater ecosystems and their reactions to climate change, why projects like 'Throughflow' are important. What risks there are to our collections. Defining IPM, why it is essential to museums, IPM top tips.

Week 8: Object handling and conservation. Dealing with breakages.

Week 9: Key differences between bryozoans and corals, identification key for bryozoans and corals. How to handle specimens safely, what to do in case of breakages, and what exactly is conservation. Scientific nomenclature explained; why species are named this way.

Week 10: How we can measure knowledge growth. 'Mystery' specimens as a practical application of techniques learnt over the previous ten weeks.

At times, these topics formed the basis of chats with the public, and this might encourage repeat visits to the SPA. However, it has to be said that conversations with the public varied greatly. From early in the development of the programme feedback to the volunteers project manager was encouraged and the programme modified accordingly. Being open to change has been one of the strengths of V factor. Throughout the early stages two volunteers with experience in evaluation observed the progress of the scheme and those involved, whether staff, volunteer or visitor, and they subsequently produced a report on their findings.

Pilot project evaluation

A pilot project evaluation was carried out for 10 weeks, at a time when the project was already in place. At that time, the evaluators observed and analysed the working of the programme and its participants. The participants included 5 V factor volunteers (for the purpose of their report they were referred to as VVs), 6 volunteer Leaders (VLs), the curator and 2 Evaluation Volunteers (EVs) headed up by the Volunteers Project Manager (VPM, Ali Thomas), and members of the public. The evaluators understood that the V factor involved work on the 'Throughflow' project, focussing on fossil corals from Indonesia. The aims of the evaluation were to ensure the VVs individual needs were being met; to discover prior knowledge about the role of a museum and distance travelled; to discover if the VVs developed practical skills over each session; to discover if the VVs absorbed the key messages outlined in each session; to find out how beneficial each session was for each VV personally to discover how beneficial interacting with the public has been for the VVs; and to discover any areas/ suggestions for improvement.

The methods used by the evaluators included mind mapping (Mindmapping, 2012) as a method of discovering the distance travelled by volunteers (their learning) over the 10 weeks they spent with V factor. In Week 1 participants we provided with a blank mind map sheet and asked to create their own personal mind map surrounding the question "What is the role of museums?". Each volunteer was then asked to contribute their answers to a master mind map written on a white board (Fig. 3). The responses were then analysed, trying to ascertain prior knowledge and/or preconceptions. This exercise was repeated Week 10 to assess the distance travelled.

Two questionnaires were also used in the evaluation process. A general questionnaire (Appendix 1) was completed every week by the V Factor volunteers to discover if any practical skills and knowledge was gained in that session. The questionnaires were completed online via iPads so that they could be collated easily. In each of the latter weeks a second questionnaire was completed by one of the volunteers interacting with the visiting public. This questionnaire was used to capture the number and quality of the interactions, how beneficial to the volunteer these interactions were and how they might improve the interactions with the public.

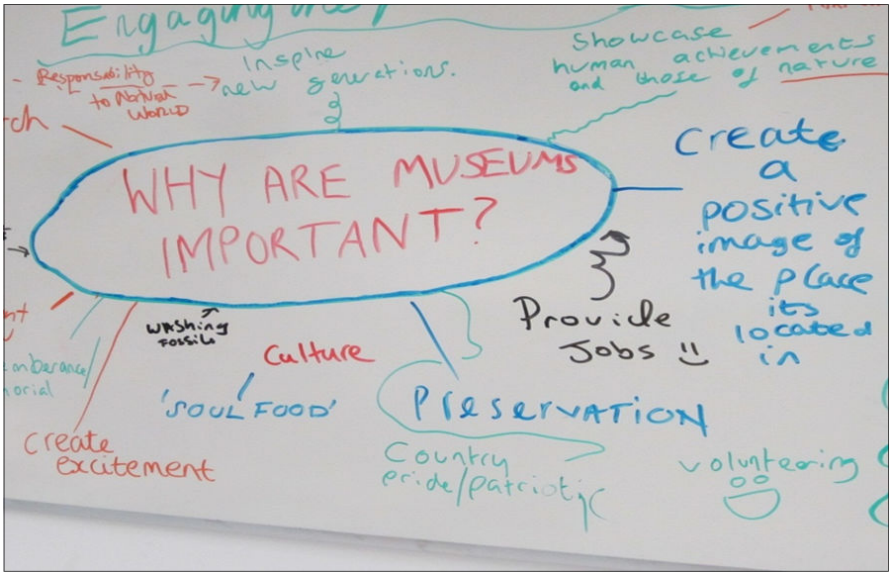

Fig 3: Mind Map completed by one group of V Factor volunteers at the end of their ten week placement. This map was compared with the one produced by the same group at the beginning of their training. The technique was used to evaluate the learning of the volunteers. (Photo: A.T.)

Observations were carried out by the evaluators over three V factor sessions; at the beginning, middle and end of the 10 week programme. The following variables for visitors directly outside the SPA space were recorded: time of observation; activity in the SPA at that time; whether or not a volunteer leader/volunteer was then present outside the SPA; the demographics of each group (gender, age of each visitor); approximate 'stop' times (length of visitor interaction with SPA activity); level of interactions between visitor and volunteer leaders/volunteers; conversations (including quotes); and total number of visitors who stopped or did not stop at the SPA during an observation period.

What has been learned

The evaluation during the pilot stage of V factor by CM and TS has produced many interesting results, which are discussed below. With supervision by the VPM the evaluators (also volunteers) were able to assess aspects of the programme for visitors and volunteers and to produce a meaningful report on their studies.

1.Mind mapping: In Week 1 when asked 'What is the role of Museums?' 26 responses were given by the volunteers. The evaluators identified 17 different responses, the most popular being: 'Preservation and Exhibit/Display'. These were both mentioned by 3 out of the 5 volunteers questioned. In Week 10 when asked the same question, 46 responses were given, including 24 different responses. The most popular responses were: 'Preservation, Exhibit/Display' and 'Allow Access', each of which was mentioned by 4 out of 5 volunteers. There were also changes in the language linked to the maps – responses became more specific by Week 10. Specific roles and tasks also became more frequently listed.

2.Volunteer questionnaires: When the volunteers were asked to agree or disagree with the following statements, there was 100% agreement that V factor had made them more aware of the scientific work of the Museum, Increased their knowledge and understanding of museums, inspired them about science, and led them to recommend V Factor to others. They rated their overall experience in terms of enjoyment as 100%. Ratings concerning the benefits of individual sessions definitely improved over time. In week 1 the highest rating was 9 (out of 10) and the lowest 3; by week 9 the highest was 10 and the lowest 7.

Some quotes from the volunteers include;

"…Taking part in V Factor has been both a fun and educational time."

"V Factor gives me the opportunity to learn new things about science, meet with intelligent young people doing research and talk with visitors from all over the world."

When the volunteers were asked about their interactions with the public, a selection of the responses were:

"I found it fun and very beneficial, I learnt much myself, as well as teaching others."

"It was good, quite fun + interesting to get response from very different kinds of people."

"Very scary at first!! But found it enjoyable after my 3rd interaction. Helped build up confidence + gain better understanding of the project."

3.Visitor observations: Over 11 V Factor sessions the evaluators observed 869 visitors passing by the SPA. Of these, 73% took some interest in V Factor, 60% stopped outside the SPA for more than 10 seconds, and 13% interacted with one of Volunteer Leaders. As a comparison, it was observed that on a non V-Factor day, when a scien-

lst worked in the SPA in view of the public, 57% of visitors did not stop as they walked past.

Evaluations from the first session saw 123 people stopping in 2.5h to look at the work in the SPA and/ or to ask the volunteers questions relating to 'Throughflow' and V Factor. Many interactions lasted longer than three minutes. Evaluations from the sixth session saw 215 people stopping in 1 ¾ hours, with many interactions lasting for two minutes. On average VV's interacted with 12 visitors whist outside of SPA. When volunteers were absent from outside the SPA the stopping time decreased to less than one minute.

Some pertinent quotes from the visitors included:

> *"This information is hugely important! Thank you V Factor."*
>
> *"Really interesting stuff, I had no idea that corals were in such danger from climate change."*
>
> *"Fantastic information and research that the collaboration of teams are working on.Very informative and professional and a good insight into the inner workings of a scientific project."*
>
> *"What a wonderful experience, seeing scientists and volunteers at work it's really a privilege. Thank you!"* –Visitor & Director of Education from the KwaZulu-Natal Museum in South Africa.

At the end of their paper the evaluators included some limitations, failures and recommendations associated with the evaluation process. For example, the time allotted to the evaluation process was limited; to ensure any progress through evaluation, this should be an ongoing procedure. However, overall the evaluation has informed those involved in the project and also provided support for these people when seeking to extend the V Factor programme in the Museum.

Links with other work

The UK government has great interest in how museums can be used to support lifelong learning (Hooper-Greenhill & Dodd, 2002). As the authors note, although it may be difficult to assess statistically any effects, there are real social impacts that museums can achieve, for visitors and for staff. For visitors but more especially for volunteers, there are opportunities to build competence and capabilities (Silverman, 2010). Grenier (2010) describes how museums can be the focus of conversations, discussions, debates and social interactions, all aiding lifelong learning. At the end of their report, Hooper-Greenhill & Dodd (2002) recommend the development of programmes with realistic, focused and strategic objectives and clear evaluations. It is hoped that the V factor scheme has begun to address these goals by developing clear aims and evaluating what has been accomplished.

Museums have long been exhibiting at least part of their collections to the public; one of their major goals (Rader & Cain, 2008; McPherson, 2006). However, as times have changed, so museums have to adapt to new ways of teaching and learning (Janes, 2009). Although visitor numbers in the NHM have always been high, there continues to be the question about how best to communicate the role of the Museum to the public and its supporters; which may be the case for any museum. Whilst in the past simple observation of life's wonders was considered to be acceptable, in the modern world with all its alternatives for digital observation and learning, museums have to develop new schemes for teaching and learning. With respect to science, observation of working scientists is being used in many places, including the NHM (Meyer, 2011). This allows visitors not only to be aware of what scientists know but also how they come to know. Even scientific field work can be made clearer through seeing collected field samples being processed; it bridges the gap between the known and unknown. Other techniques often being used are personal, sometimes one-to-one interactions between museum staff and visitors (Lehr *et al*, 2007; Carney *et al*, 2009; Meyer, 2011). V Factor is one way that links between museum work and visitors can be established.

Volunteers can provide much assistance in museums (Wilson, 2000). These individuals are generally well-educated and interested in learning, perhaps more so than the general visitor to a museum. Providing learning experiences for this group, whilst still benefiting from their assistance, is one of the goals of volunteer management. Meeting with professional staff, being informed about the rationale behind their work and being asked about their views, all in informal settings, are ways of improving the volunteer experience.

Volunteers can be very useful in respect to observations of scientific work and in one-to-one interactions. For example, scientists expected to work in public view and answer questions may feel they are being distracted from their primary tasks, as noted in the review by Meyer (2011) on the open laboratory at the Deutsches Museum in Munich. Volunteers may have more time and patience to do more routine tasks and to speak with the public. In addition, volunteers may be more approachable to speak with the general visitor on a one-to-one basis. After all, they are not experts in the research programme and not so embedded in academic/ scientific nomenclature. In V Factor, the 'Throughflow' project is communicated to the public via volunteers. Thus the V factor scheme at the NHM addresses both of these points – visitors observe volunteers carrying out scientific work and volunteers speak with the visitors. Through the project, the museum is able to improve its role in education.

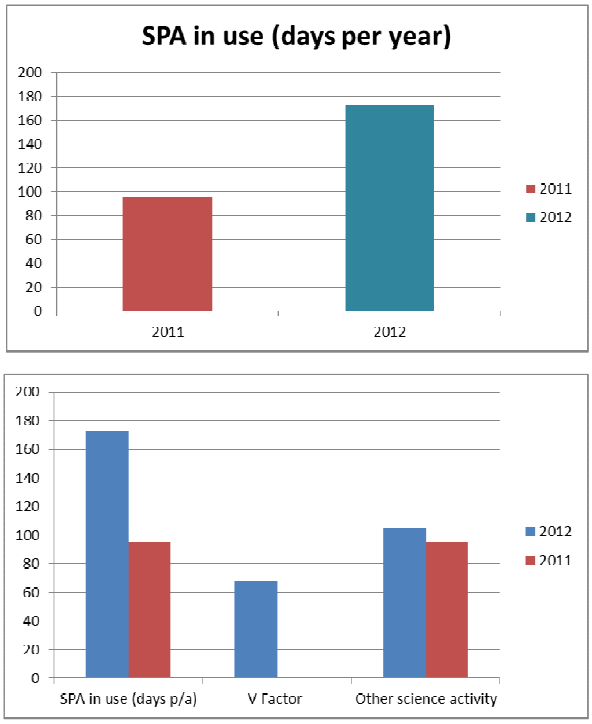

Fig. 4. Bar charts showing use of SPA space.
The top graph shows the doubling in use of the space due principally to the V factor programme.
The graph below demonstrates that other science activities also increased in the SPA area during the period when V factor was operating.

Future plans and recommendations for improvements

The programme has represented and showcased the scientific research presently being carried out by the NHM. Once the 'Throughflow' project is completed there will be another large scale project using the same formula and framework, although the primary focus will be different. The SPA may also become useful over more days each week, including the weekend when most visitors attend the Museum. The success of this pilot scheme has demonstrated the sustainability and the need for the V project, as reflected by changes in use of the space (Fig. 4).

There was a major investment of time required to set up the programme, principally by the Volunteers Project Manager and the Project Leaders. However, now that a framework is in place, it is expected that the management need not be so time-intensive. There will always need to be staff input into the V factor, as projects and teams change and as the scheme progresses. New annual projects will follow the same format but the nature of the project and work will change. Early signs are showing that there is a large pay off for invested time versus outputs as demonstrated by the evaluation above, and future ongoing evaluation will demonstrate whether or not this continues..

At each turnover of projects there will be new scientists and collections staff involved. They will always require support to ensure they have the training and confidence involved in working with the volunteers and visitors. One of the important factors is their ability to run sessions and manage volunteers. Whilst many staff have experience with public outreach, some scientists have expressed the opinion that teaching went far beyond their delivery of scientific content and can encourage their professional development.

More emphasis in the future will be put on teaching the Volunteer Leaders how to deal with the public and a variety of situations - they need to have both confidence and support in dealing with a variety of situations outside of their immediate roles. This can be anything as simple as locating the nearest toilets through to handling difficult individuals or groups.

It is hoped that the programme will continue to improve. We have been testing the volunteers, using informal quizzes, to determine how well they have retained new information. They have also been involved in evaluating and reacting to the present scheme, so that it can develop. Most importantly, all the volunteers involved in V factor remain open to suggestions.

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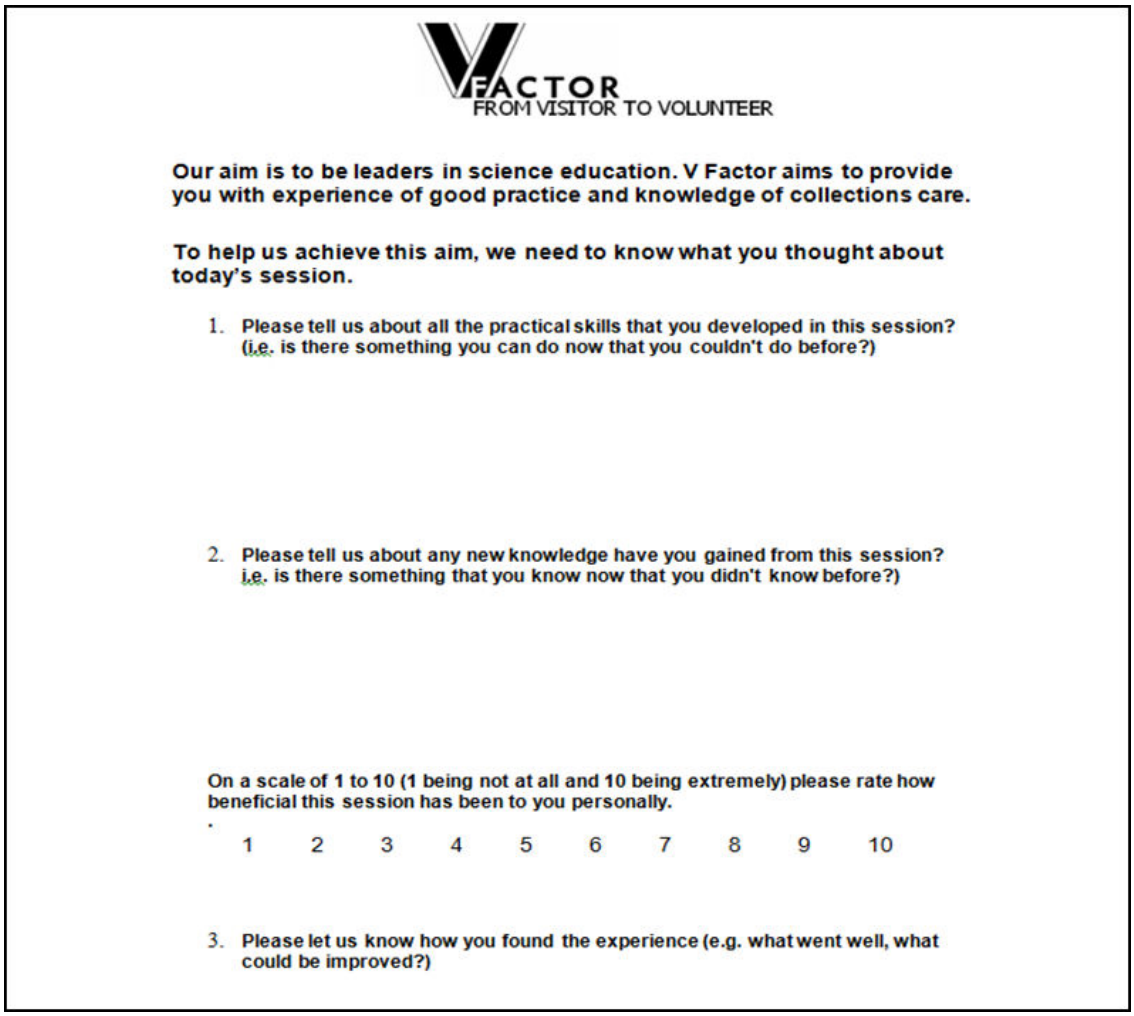
Appendix 1

Assessment form given to volunteers to complete following each session. This was used for the evaluation process. (Produced by CM & TS)



V FACTOR
FROM VISITOR TO VOLUNTEER

Our aim is to be leaders in science education. V Factor aims to provide you with experience of good practice and knowledge of collections care.

To help us achieve this aim, we need to know what you thought about today's session.

1. **Please tell us about all the practical skills that you developed in this session? (i.e. is there something you can do now that you couldn't do before?)**

2. **Please tell us about any new knowledge have you gained from this session? i.e. is there something that you know now that you didn't know before?)**

On a scale of 1 to 10 (1 being not at all and 10 being extremely) please rate how beneficial this session has been to you personally.

1 2 3 4 5 6 7 8 9 10

3. **Please let us know how you found the experience (e.g. what went well, what could be improved?)**