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The role of educators in promoting collaborative research

Stavroula Golfomitsou, Theocharis Katrakazis and Alison Heritage

Introduction

1 One of the challenges for education in applied science disciplines is to identify and establish new paradigms of practice that respond to the changing needs of a sector. Forward thinking is essential for academic institutions and training centres, since the objective of training programmes is to produce professionals capable of functioning effectively not only at the point of their initial entry into the workplace, but also in the future. Current dynamic shifts in science, education and society can be seen as an opportunity for greater engagement with policy and educational bodies in and outside heritage conservation field to gain fresh perspectives for a more responsive and impactful future.

2 Heritage science plays an instrumental role in contributing to the understanding, enjoyment, access, and sustainable use of cultural heritage, and thus in delivering benefit to client communities within the heritage sector and to society in general (ICCROM 2016a). By nature it is an interdisciplinary applied science field, the relevance of which relies on bridging the gap between research and practice. Within the heritage sector there is an increased emphasis on people-centred approaches as a means to strengthen the links between people and heritage, and promote sustainable conservation. At the same time, ongoing discussions focus on how to enhance effective collaboration so that research processes become more open and relevant to current challenges. These follow similar initiatives at science policy level as well as movements towards promoting public engagement and empowerment, such as the emergence of crowd science or citizen science, as a means of pursuing collaborative scientific research projects. However, this requires the active collaboration of an increasing number of actors and knowledge sectors.

3 This issue was raised during the ICCROM Forum 2013 on Conservation Science, which in its findings called for responsible action towards promoting collaborative research based on needs assessment, participation and sharing, whereby interdisciplinary working and the active engagement of end users are fostered within the research process (Heritage & Golfomitsou 2015). Nevertheless, in order to optimise participatory practices within research, the key defining characteristics of successful collaboration need clearer definition—as well as the ways by which this can be more effectively incorporated and promoted within research-based education.

The changing science research landscape

4 Research in mainstream science is becoming increasingly more collaborative, international and problem-orientated (Smithsonian Institution 2009, 19). This transition is taking place at multiple levels, marking a new era with expectations for more inclusive and accountable research activities that can lead to greater value-added for society – including playing an instrumental role in the realisation of the Agenda 2030 for Sustainable Development (UNESCO, 2015a:9).

5 Based on the premise that open and collaborative knowledge systems are more resilient and impactful, current policy paradigms at national and international level are centred on concepts of responsibility and openness (see as an example for Europe and beyond, European Commission 2015a, and OECD 2015). The former refers to the re-contextualisation of science's primary goals to reflect the grand societal challenges, while the latter focuses on the ways research is undertaken, collaboration is practiced, and knowledge is disseminated (European Commission 2015b). In essence, together these illustrate a shift towards re-defining goals and re-examining the processes out of which more effective research results can derive.

6 The impetus for these changes primarily stems from a broader discourse initiated by the scientific community, funding bodies and other stakeholders over the last decade or so, on how to strengthen the reflective capacity of science and its role in the service of society. Generally speaking this requires a new social contract within which citizens and civic society organisations are able to play an integral role into science policy dialogues (Wilsdon et al. 2005; Wilsdon 2008). Currently, support for participatory governance extends across many science-related fields to encourage horizontal decision making processes, improve the quality of decisions and enhance their effective uptake and implementation.

7 In addition to this is the desire to enhance public understanding and appreciation of science. In Europe actions for public engagement are supported and promoted by Horizon 2020 (the European Framework Programme 2014-2020, previously referred to as FP8) under which public engagement is fostered through multi-actor open consultations (e.g. Voices for innovation, Voices of Culture, etc.) and direct involvement in the research process (http://ec.europa.eu/research/swafs/index.cfm?pg=policy&lib=engagement). Crowd science or citizen science initiatives have been growing increasingly at international level, and while the majority focuses on basic and life sciences, some noteworthy examples relate to archaeology, arts, archive digitization and preservation. Such initiatives follow a broader change in the way culture and cultural heritage is studied, valued and appreciated, and reflect a desire to open up to a wider audience

including heritage creators, users, and caretakers. Examples of such projects are the MicroPasts (http://micropasts.org/about/) and the Citizen Archivist Dashboard (http://www.archives.gov/citizen-archivist/).

8 Achieving greater impact, transparency and collaborative practices requires changes at many fronts, among which the level of openness of the scientific community, the ways research is done and science is organised (European Commission 2014, 2). Current policy endeavours place particular emphasis on open scientific practices and the way scientific information is communicated. Under the umbrella term "open science" openness is embraced via the efforts for open access to research outputs, open research data and inclusive collaboration. Countries, international funding bodies and professional sectors are increasingly developing policies to promote this change. While open access publication of publicly funded research is becoming a common practice at international level, disclosure of research data has widespread implications from lack of incentives, to confidentiality, ownership and intellectual property issues (OECD 2015).

9 At European level, recommendations for future science policies focus on the ways through which an open knowledge system can be realised. These broaden the concept of open science to include open education, open research infrastructures and a new concept for intellectual property (European Commission, 2015c) conveying a message for concerted action towards a system of open collaboration.

10 Besides the driving forces that imply the ever-growing need for collaborative activities in research as described above, and the policies developed by funding bodies that subsidises collaboration, co-working in research delivers benefit at many levels from socioeconomic to scientific; perhaps the most obvious of which is the economic benefit of pooling resources and sharing data, tools and infrastructures (European Commission 2015c, 51).

Heritage science research: its value and the interaction of the actors involved

11 On a practical level, open research collaboration within heritage science presents clear pragmatic advantages. The cultural heritage sector has many traits that make it an ideal candidate for such, being a primarily non-profit sector that produces little in the way of significant industrial patents and does not concern sensitive data such as nuclear or defence data.

12 Heritage science addresses problems that have a high level of complexity, which requires input from multiple expert areas– hence interdisciplinary collaboration is needed. The heritage sector is also highly fragmented, suffers from a lack of resources, and meanwhile instrumentation is becoming increasingly sophisticated and expensive. Therefore, pooling science, technological and human capital resources and associated data makes sense for cultural heritage research.

13 Heritage conservation science activities contribute both directly and indirectly to the creation of "cultural value" (see Holden 2004; 2006). However, this cultural value is not created in isolation, but rather is an outcome of the inter-linkage with other stakeholders from professional peers, policy makers, and the public. In this interwoven network of diverse actors and knowledge domains, effective communication and collaboration both at micro (among professionals) and macro level (participation of public and other stakeholders) is important to achieve impact and deliver benefit.

14 But who participates in the planning and evaluation of heritage conservation science activities? In September 2015, ICCROM launched a worldwide survey to trace the ways institutions involved in heritage science research plan their activities and evaluate their performance (ICCROM 2016b). The survey was distributed to 188 institutions actively involved in heritage conservation science research from 60 countries. From these, the survey received 94 responses from 89 individual institutions in 38 countries. The majority of responding institutions were public sector, primarily supported by governmental and inter-governmental funding bodies. The results reveal that institutions tend to rely on closed, expert-driven, and producer-orientated practices to identify research priorities, most frequently through informal information exchange at workshops, conferences etc. At the same time, about half of the respondents indicated that research needs are rarely determined through national research agendas, or formal communication processes with their primary clients and research end-users (e.g. surveys).

15 Moreover, institutions reported that their research activities are largely evaluated in terms of inputs and outputs such as the grants received, the number of publications produced, and the number of training activities delivered. Meanwhile, evaluation of the actual outcomes (as perceived by their client communities) is rare. Overall this illustrates an output-focused evaluation system with limited formal connection to the research beneficiaries.

16 The results of the ICCROM survey on planning and performance in heritage conservation science are compiled into an interactive data tool and can be explored at http://www.iccrom.org/planning-and-performance/.

What is collaboration in research?

17 In its broader sense, collaboration in research is demonstrated through connections between individuals and organisations, with the researcher -in heritage conservation science this being the heritage scientist or conservator (either affiliated with a university, government agency, private practice, or industry) - playing a central role. It is *"a social process whereby human beings pool their experience, knowledge and social skills with the objective of producing new knowledge..."* and hence, has as much to do with social and scientific networks as with knowledge capacities developed through training and education (Bozeman & Broadman 2014, 2).

18 Beyond the inherent value of co-creating, co-discovering and teamwork to accomplish shared objectives, collaboration holds potential to improve the quality of scientific discovery, through the complementary nature of the disciplines involved. Openness in collaboration drives exposure to new ways of thinking, ideas and concepts. New collaborations outside familiar territories can accelerate diffusion of knowledge from one field to another, which contributes to the enlargement of research networks and enhances sector visibility.

19 For these reasons higher education in conservation and heritage science has a responsibility to promote a culture of sharing and collaboration through building effective partnerships between academic institutions, heritage organisations and industry partners, and exposing students to real world complexities which foster critical thinking and responsible attitudes (Golfomitsou 2015).

Key elements for successful research collaborations

20 The key factors that make collaboration work are not clear—despite this being a common experience. A relatively recent study in research collaboration within the field of heritage science indicates that collaborative practices take considerable time and effort to mature and deliver effective results. However, 8 in 10 respondents reported that healthy collaborations, built upon shared goals, interests and enthusiasm, provide value-added to the process and ensure higher potential in achieving project's goals (Bell et al. 2014, 4).

21 Research conducted by the National Research Council (2015) on enhancing effectiveness of team science, provides similarly useful insights on some of the key processes (cognitive, affective, and behavioural) which influence the capacity of a research group to co-work efficiently. These include the importance of shared understanding and alignment on research-goals and responsibilities among team members; the way knowledge is shared and communicated throughout the research process; as well as team cohesion (interdependence) and sense of efficacy (National Research Council 2015, 63-70). However, as much these attributes can influence the level of effective co-working, so too does the role of a team leader, which in turn can facilitate these processes, strengthen ties within a group and motivate its members to share data and credit (Bennett & Gadlin: 2012).

22 Analyses of collaboration practices also identify the power that prior acquaintance and trust holds in collaboration. Institutions are more likely to collaborate if they have experience of working together (Paier & Scherngell 2008, 17), since prior acquaintance enhances communication and reduces transaction costs (i.e. time needed for building trust among collaborators). Trust is acknowledged as an essential element for effective collaborations within and between institutions – without it co-working becomes problematic, counter-productive and difficult. Trust in part relies on the confidence collaborators have concerning the competencies of their colleagues (Bennett et al. 2010, 19; Bozeman & Broadman 2014, 16), but it also relies on interpersonal relationships and team processes. Building trust is not an easy task where reward feeds and is often fed by competition since it requires openness and a positive attitude.

23 Especially revealing are the results of the Aristotle project, launched in 2012 by Google to explore how teams work best in order to inform its future strategies. Looking for the key enablers of effective team-working, it became clear that answers may lie within a team's shared unwritten rules and norms, which shape team member interactions and create a healthy and safe group culture (Duhigg 2016). In other words, a shared *"sense of confidence that a team will not embarrass, reject or punish someone"* for expressing her/his opinion or taking a risk (Edmondson 1999, 354); in the case of Google, psychological safety was found to be critical to the way teams function (Duhigg 2016). In addition to team spirit, collaboration also requires reflective individuals with a developed understanding of their own values, personality type, and tolerance in having their opinions challenged. Although in theory these elements appear simple they are nevertheless complex and challenging in practice. Team-working requires continual effort through which improvement comes with practice and reflection (Bennett et al. 2010, 5; 9-10).With this in mind, one is tempted to re-evaluate previous and current collaboration experiences. As authors of this paper, who studied and started working at different time periods and in diverse environments, our stories and perspectives vary, yet share a common link: co-working

becomes a fruitful co-learning experience when you and your colleagues feel comfortable being yourselves (Edmondson 1999), without fear of undeserved judgement.

How can education contribute?

24 Given that effective collaboration relies on diverse competencies (knowledge, skills, attitudes), educational programmes in heritage science should focus not only on scientific skills, but also on soft transferrable skills. Key competencies go beyond the technical and intellectual formation of a professional to include non-academic knowledge. Although there is no agreement in the terminology used to describe these skills—which are varyingly referred to as "non-academic", "non-cognitive"," transversal competencies" or even "21st century skills"—they are as important as the knowledge and other competencies acquired through a degree programme (UNESCO, 2015b). These skills are related to the development of critical and innovative thinking, inter-personal and intra-personal skills and global citizenship (UNESCO, 2015b). Therefore, while the academic content of a programme is a priority, these issues should not be overlooked.

25 The ability to work as part of a team is an essential inter-personal skill. In addition to being effective team member an individual needs to have well-developed intra-personal skills such as commitment, self-motivation, respect for others, integrity and self-discipline to name but a few. Through group work students develop social skills, learn from each other and learn to solve problems arising from differences in approaches and perspectives (Hodgkinson-Williams et al. 2008). The integration of group work in training programmes is essential for students to learn how to conduct effective collaborations in the future. In addition to collective learning through collaboration, networked learning whereby knowledge is obtained through networks is also important (Cronin et al. 2014). These two types of learning which are characterized by social learning theory (Fearon et al. 2012) could form the basis of a new way of setting up training programmes in which collaboration and networking between participants, educators and other actors from within and outside the sector become centre stage. The benefits, for young professionals, are that they gain a first-hand experience in research, and form realistic expectations by interacting with different actors in the field. Through these experiences, participants develop the tools to deal with arising problems, while learning how to function within a collaborative professional framework, thus building the foundations for a successful future career.

26 That said, group work is not always easy and personality traits play an important role as to how group work is carried out. There are groups that bond immediately while others are characterised by lack of trust in each other's abilities and personalities. The difficulties in the organisation of group projects especially in relation to personality clashes can be off-putting for all parties involved. This can be particularly evident in mixed cohorts where students come from different educational systems, different cultures and/or religious backgrounds. In such groups diversity, while a powerful tool in training, can create disruptions and lead to deviations from the original course objectives. In the latter case, there are mediation models in place that can facilitate the way a group functions.

27 Team-working starts early on in education (i.e. primary education) and ideally should continue at higher education through problem- and research-based approaches. The challenge in graduate programmes is how transversal competencies can be developed

following standardised procedures. Nevertheless, the educational benefits are enormous in terms of enhancing learning capacities and creating graduates with solid professional skills, who are able to function effectively within collaborative partnerships and as such demonstrate greater adaptability within current and future working environments.

Conclusion

28 Educational programmes in conservation and heritage science continue to evolve following changes in the wider socio-political context. These changes inevitably affect the way knowledge is produced and shared. Research-based learning allows students to become not only knowledge consumers but also knowledge producers. Group work within a learning environment encourages the development of transversal competencies which are essential to further career development. Exploring new teaching and learning strategies and establishing real-life projects creates communities of practice which will adapt better to future market needs.

29 Openness and flexibility in course design is necessary for providing relevant training to individuals with different needs and competencies. Honesty in relation to expectations and awareness of cultural differences and geopolitical contexts is vital, as well as understanding that there is always more than one solution to the issues at hand and there are no "ideal" self-contained fields of operation.

30 If this idea is structured and strengthened within educational programmes, graduates will without doubt experience greater success in establishing future collaborations. Research-based learning can contribute to shaping graduates with an open-minded attitude towards the diversity of problems encountered in the preservation and use of cultural heritage preservation and the creative ways in which to seek solutions.

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ABSTRACTS

This paper examines some of the current science policy paradigms set at international level to promote open science and participatory research, and discusses how key factors necessary for successful collaboration can usefully contribute to the training of future conservation professionals through group work and research-based learning programmes.

Cet article examine certains des paradigmes actuels de la politique scientifique établis au niveau international pour promouvoir la science ouverte et la recherche participative. Il analyse comment des facteurs clés nécessaires à la réussite des collaborations peuvent contribuer utilement à la formation des futurs professionnels de la conservation à travers des programmes d'apprentissage fondés sur la recherche et le travail en groupe.

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Keywords: heritage science, conservation science, research collaboration, team working, science policy, education
Mots-clés: science de la conservation, science du patrimoine, recherche, collaboration, équipe, science, éducation

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ALISON HERITAGE

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