Smart Cities MOOC

Teaching citizens how to co-create smart cities

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Abstract—**There is increasing recognition that the ICT4S community needs to take a role in both developing education and conducting research on how to educate people in using ICT to make urban areas more sustainable. In this paper we explore the question how can a Massive Open Online Course (MOOC) be used to engage citizens in learning about smart cities and teach them how to co-create a smart cities project in their community. We discuss our experiences of designing and delivering a Smart Cities MOOC, a multidisciplinary course targeted at an international audience and built upon the pedagogical approach of social learning that is supported through FutureLearn, the MOOC platform on which the course is delivered. We use data gathered from the first presentation of the course to evaluate the motivations, demographics, online participation and experiences of our learners. An analysis of social learning interactions also provides insight into citizens' views on smart cities and we identify how the MOOC can be adapted to meet the learning needs of smart city initiatives and potential areas for future research.**

Index Terms—**Smart cities, MOOC, learning, education, citizens, ICT4S.**

I. INTRODUCTION

Today, more than half of the world's population, 3.9 billion people, live in urban areas and by 2050 this is expected rise to 66% [1]. Cities are centers of innovation and creativity, but they face great challenges from rapid urbanization, climate change and increasing pressure on city services like transport and healthcare [2]. Smart cities is a widely used concept that seeks to address such challenges. There is no unique definition of what a smart city is, but what many definitions have in common is they consider the use of information and communication technologies (ICT) to improve the efficiency of city services, to reduce costs and resource consumption, to address societal challenges and improve collaboration between citizens and government [3,4,5,6,7].

Some argue that separating the concept smart from sustainable implies a city can be smart without being sustainable and a better definition would be smart sustainable cities [7,8]. Smart city approaches can be broadly classified into top-down initiatives, driven by the needs of government and industry, and bottom-up approaches focusing on citizen engagement and enabling behavior change [9]. It is likely a combination of the two approaches is best, but there is increasing recognition that smart cities need to be people-centered, supporting community based innovation and active citizenship [10,11,12,13].

In fact the greatest challenge smart city projects face are not technological but the challenge of approaching them with an open mind-set and embracing a participatory approach [13]. There is increasing interest in how participatory design approaches, such as co-creation, can be used in smart city projects and it is recognized that education and learning experiences play an important role within these [14]. While citizens are experts in their own experiences, very few are aware of what smart cities are, consequently if engagement is to be meaningful we need to create education opportunities for citizens to learn about smart cities and teach the knowledge and competencies to enable them to express and develop their ideas.

Within the ICT4S community research to date has focused on educating students studying ICT related disciplines within higher education institutions [15,16]. Grosseck et al. [17] explored how Massive Open Online Courses (MOOC) could be used to support citizen participation in smart cities and a literature review identified 6 courses, in areas such as city design and the use of technology in cities, but their contributions to supporting smart citizens was indirect.

In this paper we explore the question how can a MOOC be used to engage citizens in learning about smart cities and teach them how to co-create a smart cities project in their community. Whilst the possibility of using MOOCs to support citizen learning and participation in smart cities has received some attention in the literature [17,18], the opportunity is still poorly understood. This paper contributes to the ICT4S community by providing an empirical study that evaluates the design and delivery of a Smart Cities MOOC [19], which been developed as part of MK:Smart [20], a large smart city initiative led by the Open University (OU). The paper uses data gathered from the first presentation to evaluate the success of the course and provides insights into the demographic profile and motivations of the learners, as well as their online participation and feedback on the course materials. An initial analysis of social learning interactions also reveals insights for the ICT4S community into citizens' views on smart cities.

Our insights lead us to conclude that the Smart Cities MOOC is successful at attracting a large and diverse international audience to learn about smart cities, who engage in collaborative problem solving. However the high attrition rate, common with MOOCs, could limit the social impact of the learning community. Despite this, there is high satisfaction in learners who complete the course and the research provides valuable insights for the ICT4S community on how to design

educational materials on smart cities, as well as insights into citizens' views on smart cities.

II. COLLABORATIVE LEARNING ON SMART CITIES

Smart Cities is an emerging topic for education and current thinking holds that the significance of smart cities lies not in technology alone but in its implications for society [8,10,11,12,13]. Our aim is to create a short introductory course on smart cities in English that is citizen centered, enabling citizens to navigate their own path through the complex landscape of smart cities. The course needs to be multidisciplinary, to reflect the diversity of perspectives that contribute to smart city development, including disciplines such as engineering, ICT, design, systems thinking, transport planning, environmental sciences, social sciences and the arts, as well as citizens.

Smart cities is a topic of global interest and an open course provides an ideal course format as they can attract a large proportion of international learners. This can create a culturally rich learning environment where course discussions can bring together diverse views which provide further opportunities to learn beyond the course materials. However, an international audience brings the challenges of designing content to deal with cultural differences, including time zone differences, language and use of communication tools [21]. Our challenge was to create a learning resource relevant and meaningful to global learners. We use city case studies from around the world to build diversity into the course content, as learning through case studies encourages active learning, bridges the gap between theory and practice and can increase the desire to learn [22].

The benefit of MOOCs are that they are learning spaces that enable cross-cultural sharing and collaborative problem-solving that collapse time zones and national boundaries [23]. They also provide flexible learning opportunities for those excluded from traditional universities, due to entrance requirements, cost or accessibility. Although it should be noted that international learners studying in English are likely to be well educated if they live in a country where it is not their first language. Large numbers of learners also benefit from being exposed to the same curated set of high quality learning resources on smart cities. To address language and communications barriers, transcripts were provided in English for video and audio steps, we explain core concepts in simple language and with videos, and facilitators provide support where learners have problems understanding concepts due to language barriers.

Open education also offers benefits to wider society through the opportunity to address 'wicked problems', problems that cannot be solved by one individual, organization or country [24]. This is particularly pertinent to our MOOC as the urban challenges smart cities seek to address, such as climate change, poverty and quality of life, are often referred to as wicked problems.

Education at massive scales does, however, also present significant challenges for course moderators including maintaining student engagement, navigating the large number of discussions and identifying problems within a course where thousands of learners are commenting [24].

III. COURSE DESIGN AND CONTENT

The Smart Cities MOOC design is informed by the OU's approach to learning design [25] and the Futurelearn platform, which promotes the linear 'X-MOOC' style of presentation. This has been developed to make the pedagogy explicit, it is based on social learning through commenting and discussion, provoking conversations and marking learner progress [26]. Early in the course design a stakeholder workshop was run, attended by 23 MK:Smart partners from local government, universities, business and the community sector, to gather a diverse range of ideas for the MOOC content. This was followed by a learning design workshop to create the course structure for each week and the content was developed through a collaborative process involving the authors, editor and production team.

The key learning objectives (LO) of the Smart Cities MOOC are that by the end of the course learners should be able to:

- LO1 - Describe different approaches to smart city design and delivery
- LO2 - Co-create a smart cities project in their community using a range of tools and techniques
- LO3 - Share and discuss their views on smart cities as part of a global learning community

Learning is culturally and contextually dependent, and ideally undertaken within an activity where people learn by doing [23]. So the MOOC is designed to enable learners to reflect on what they are learning about smart cities concepts, to consider how they are relevant to their own urban area, it encourages them to explore if there are any smart city activities in their city and provides them with tools and techniques so they can co-create a project for their community.

The MOOC is designed to be studied over 6 weeks taking 18 hours of learning time. Each week is composed of distinct teaching elements, called steps, which are article, video, audio, quiz, poll, activity or discussion steps. Table I shows the topics covered in each week. The course has been designed to build knowledge on smart cities and the competencies of smart citizens such as problem solving, creativity and innovation [18]. It uses case studies from cities around the world, including Milton Keynes, New York, Dubai, Reykjavik, Ajmer and Rio de Janeiro and Songdo, which cover the course topics and wider sustainability issues including energy, mobility, health and food. A variety of open tools are provided including the Smart Cities Project Ideas Template and Business Model Canvas, which is adapted from a business model canvas developed by Osterwalder and Pigneur [27].

TABLE I. Structure of Smart Cities MOOC

Week	Title	Topics covered
1	Introduction to smart cities	Definitions & approaches
		Urbanization, sustainability & resilience
		Systems thinking
		Wicked problems
		Smart city core elements
		Sustainability, open data, privacy & ethics
2	Smart citizens	Citizen needs and trust
		Accessibility
		Engagement approaches
		Design Thinking
		Living Labs
		Crowdsourcing ideas
3	Infrastructure, technology and data	Smart infrastructure
		Technology and Internet of Things
		City sensing
		Open, closed, shared data
		Privacy, security & ethics
4	Enterprise and innovation	Smart cities market
		Financing smart cities
		Data economy
		Open data platforms
		Business models
		Civic hacking
		Digital social innovation
		Crowdfunding
5	Leadership and Strategy	Leadership & governance
		Partnership models
		Vision and strategies
		Prototyping projects
		Business model canvas
		Standards
6	Measurement and learning	Metrics and indicators
		Value proposition
		Integrated reporting
		Learning and education
		Opportunities and barriers
		Further learning

Week 1 introduces the learners to smart cities and they explore a variety of definitions and approaches (both top-down and bottom-up) through city case studies, which starts to address the first course learning objective and they return to this throughout the weeks. It also introduces common challenges cities face and learners use systems thinking to explore challenges their city faces and draw a rich picture which they share on the Rich Picture Padlet board [28]. They use this exercise to pick a city problem which then forms the basis of the smart cities project they develop during the course. The final hour also introduces five core elements of smart city project development, a framework that takes into account the human, technological and institutional elements, and provides the structure for the following 5 weeks as shown in Table I.

Week 2 sets the scene for learning objective 2, focused around how to co-create a smart cities project. In this week learners explore the role of citizens considering issues such as the needs of different groups, engagement approaches and trust. They are also introduced to design thinking (see Fig 1.), a process that they follow to co-create their projects, with the course taking them as far as the prototyping stage. At the end of Weeks 2 and 4 there are quizzes to check understanding of the core concepts that have been taught.

Weeks 3 and 4 introduce learners to a wide variety of smart city initiatives and is focused on the ideate stage of the design thinking process. They explore the role of smart infrastructure and sensors in cities, learn about the role of data, debate the challenges of privacy and security, and look the smart city market, finance and also consider the data economy, civic hacking and digital social innovation.

Fig 1. Stages of the Design Thinking Process, adapted from Stanford Design Program and the Standard Arts Institute [29]

Week 5 looks at why leadership and partnerships are important for smart cities and learners examine the value of different approaches to developing smart city strategies, roadmaps and standards. They also learn how to prototype their project and develop a plan using the Smart Cities Business Model Canvas. In week 6 they learn about smart city metrics and indicators, study evaluation frameworks and value proposition, explore smart city learning and education through a series of case studies and discuss the future for smart cities.

The third learning objective is to enable learners to share and discuss their views on smart cities as part of a global learning community. Each step on the MOOC aims to facilitate meaningful conversation through comments and replies. Discussion steps are structured so that learners respond to questions challenging them to apply knowledge gained in the proceeding steps; some link to Padlet boards, where they are encouraged to share the outputs of activities. The course has a lead educator and course facilitators who lead discussions and respond to common questions.

The main challenge we faced in the MOOC design was the limit on the breadth of content we could cover within 18 hours of learning. Smart cities is a complex subject so the depth of study of individual topics has to be limited. Providing links to further reading material and other resources helps to mitigate this. Video footage for the majority of the case studies was kindly provided by organizations working on smart city projects. This enables us to present material representing a diverse range of views, which makes the course interesting, but places some limitations on the level of explanation within case studies, which could impact on depth of learning.

IV. EXPERIENCES AND LESSONS LEARNED

A. Methodology

The first MOOC presentation ran from September 28th 2015 for 6 weeks and 8005 people enrolled on the course. Five further presentations are scheduled between 2016 and spring 2017. In order to evaluate the design and delivery of the Smart Cities MOOC we use data analytics and qualitative data sets from the first presentation to understand who are learners are, their motivations, demographics, how they used the course and to ascertain their feedback on the learning materials and to identify what issues concerned them about smart cities.

The FutureLearn platform has a statistics dashboard for the MOOC that presents course run measures that are updated daily and include:

- Joiners - people enrolled on the course
- Learners - joiners who start to use the course
- Fully participating learners - completed at least 50% of the available steps
- Social learners - posted at least one comment

Weekly course run measures are also available such as the number of learners visiting steps, completed steps and comments, as well as downloadable datasets which include information on enrolments, step activity and comments. Data was collected up until two weeks after the course completed to allow for learners who had fallen behind in the course schedule.

An optional pre-course survey was sent to all course joiners, which 1067 people completed, followed by a post-course survey which 139 people completed. Surveys comprised a combination of Likert scale, multiple choice and open questions, delivered via the SurveyMonkey platform, and were developed from previous research on the use of open educational resources [30].

B. Learner cohort profile and use of course

Data from the pre-course survey suggests the gender ratio was fairly balanced with 57% male and 43% female, with over 80% aged between 18 and 55 years. More than three quarters of joiners already held a university degree and 65% had previously studied an online course, which is a typical learner profile for FutureLearn courses where many of the learners are highly educated [31]. The learners came from over 100 countries, with half the learners from the UK, Spain, India and Brazil (as shown in Table II) and English was the first spoken language for 45% of the learners. 5% of learners considered themselves to have a disability.

The pre-course survey asked people about their prior knowledge of the MOOC subject and their motivations for signing up to the course. 41% of the learners said they knew little or nothing about smart cities, while 44% had some experience and 14% worked in the area. Learner's main motivations for joining the course were; personal interest (70%), professional development (60%) and relevance to their work (40%) or studies (21%).

TABLE II. LOCATION OF LEARNERS

Rank	Country	%
1	United Kingdom	36.3
2	Spain	6.3
3	India	5.3
4	Brazil	3.4
5	Ukraine	3.3
6	United States	2.6
7	Germany	2.3
8	Mexico	2.1
9	Colombia	2.0
10	Poland	1.8

The number of course joiners who became learners was 3692 (46%), consistent with a typical FutureLearn course where half the joiners become learners [31]. It is common for MOOCs to lose a high percentage of their initial enrolees as many people's investment in a free course, which demands time and effort, is not sufficient for them to start their studies [32]. Figure 2 shows the distribution of learners visiting steps across the weeks. It illustrates the high attrition rate as the weeks proceed, with around 60% of learners dropping out in Week 1 and only 641 (17%) of learners reaching Week 6 and 626 of these were fully participating. Shorter FutureLearn courses tend to have higher fully participation rates but for the Smart Cities MOOC this is close to the average which is 21% [31]. MOOCs have been criticised for low completion rates, however not all the people signing up will be interested in completing the course [32] and it is easy to switch presentations. Even though the number of people learning can be significantly lower than those signing up the MOOC, the reach (i.e. location and diversity of learners) can still be massive [33].
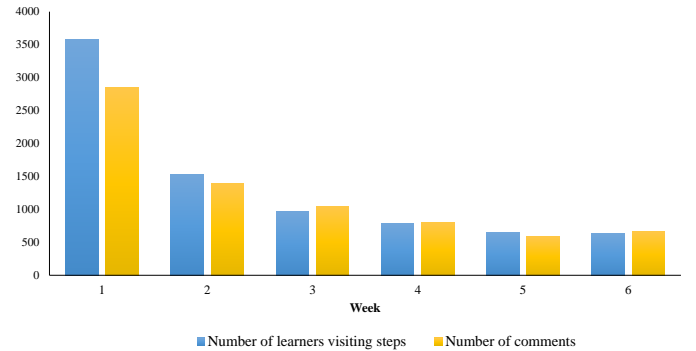

Fig. 2. Learners visiting steps and number of comments

C. Learner experiences of the MOOC

Learners provided feedback on their experiences of the MOOC explicitly in the form of comments within the course and as part of the end of course survey. The positive experiences of learners who completed all the course was reflected in the comments left in the final steps of week 6, which included statements such as:

"This has been a very engaging course which has introduced me to a lot of new ideas. Various parts of the course have caused me to question my views and this has resulted in new perspectives. There are many issues I would like to take further and I need to find the means to do so" [Dave Hall]

"A very interesting course. I particularly enjoyed reading, thinking about and discussing the various different perspectives, views and ideas of the participants, especially those whose viewpoint is very different from my own. In my experience I learn much more from those with whom I disagree, because even if they don't change my views, at least they make me think about them" [Jackie Pullman]

A reoccurring theme in many of the comments was that the course was well presented and that both the course materials and other learners had introduced them to new ideas and perspectives on smart cities, which they found interesting and would use these in their work and cities. In the post course survey, learners also shared comments about course content, as well as suggestions for improving the MOOC, such as:

"Am finishing the course much enlightened about the subject…and motivated to do something on similar lines for my city" [Anonymous]

"Some of the videos were talking heads that did not add value compared to the transcript. I have limited data, ironically for this course!" [Anonymous]

"If there is an option to download all contents of each week as a single click in a word document, it will save a lot of time for learners for serious study" [Anonymous]

Learner experiences in MOOCs can also be measured implicitly in the form of engagement and withdrawal from the course [24]. Although there was a high drop-out of learners across the six weeks, this is typical behaviour in a FutureLearn MOOC. Whilst the learner comments suggests the course was well received, the learner analytics show only a quarter of the active learners committed the recommended hours to complete the course. Some of the comments suggest that certain learners felt the time commitment was too great:

"The time required for this course was much longer than other MOOCs I have done. This was reflected in the decreasing inputs of comments as the course continued". [Anonymous]

Although 80% of those responding to the end of course survey said they felt the amount of time required by the course was about right. Unfortunately the downside of designing a course that requires learners to participate socially is that is it drives a high drop-out rate.

D. Achievement of learning objectives

A preliminary analysis of the MOOC comments has been undertaken to try to ascertain the extent to which the three course learning objectives were achieved by the learners.

LO1) Describe different approaches to smart city design and delivery

Week 1 sets the scene introducing different smart city approaches, backed up with case studies from Milton Keynes, Songdo and Rio de Janeiro, followed by a discussion step where learners are asked to compare the advantages and disadvantages of the different smart city approaches. This prompted a lively discussion with 556 comments posted on the 3 case studies steps. There were also 508 comments in the discussion step, from 373 learners, and 31% of the comments were replies to other learners. Many of the comments with the highest number of likes also occurred in week 1 and picked up on concepts such as the need to engage citizens and concerns about privacy. They also highlighted different cultural perspectives, for example the Milton Keynes case study features a garden watering app and this prompted lots of discussion with some people saying it was a good idea and others shocked to think that watering your garden is a major issue when some people struggle to find enough clean drinking water.

At the end of Week 1 learners were asked to reflect on what they had learnt so far about smart city approaches and concepts. There were 227 comments on this step from 191 learners and 21% were replies to other learners. Key concepts mentioned included the need to involve citizens, collaborative approaches, leadership and governance, the complexity of city systems, sustainability, top-down and bottom-up smart city approaches, privacy, security and ethics and the need for education and standards. This suggests that learners were able to able describe different approaches to smart city design and delivery and to express their views and opinions on them.

LO2) Co-create a smart cities project in their community using a range of tools and techniques

The process of co-creation is explained in weeks 1 and 2, and learners are encouraged to use techniques such as systems thinking and design thinking to develop project ideas. Learners are asked to draw a rich picture of their city challenges and share it on Padlet; 187 learners posted rich pictures and there were 216 comments. They then define their city problem and who they impact; 99 learners posted 164 comments and 41% were replies. We manually classified city problems by theme; the most common were transport/mobility (50), pollution (air/noise/general) (16), employment/skills/economy (12), energy (10), water and flooding (10), urban infrastructure/regeneration (9), health/social care (7), housing/homelessness (6), crime (6), community cohesion (4), food (4), communication between citizens and local government (3), and education (3).

During weeks 3 and 4 different aspects of smart city initiatives are explained and learners collect ideas for their projects. At the end of week 3 they asked to identify what types of data may be helpful in solving their problem and how they would

collect it. There were 99 comments, 41% were replies, and once again there was a lot of discussion about transport/mobility data sets but also data about social care, the rented housing sector, water, energy, local food and homelessness.

Weeks 5 and 6 teaches learners how to prototype and plan their project which includes completing the Smart Cities Business Model Canvas. The level of discussion in the relevant steps was low (63 comments), with only 21 people sharing their completed business model canvas. This was not completely unexpected, the MOOC covers a lot of material in a short time period and co-creation involves working with stakeholders so project development may take longer than the course length. Learners may have understood how to co-create a project but chosen not to share a project plan, some may have felt there was no incentive to share their project ideas or might choose not to if they are developing ideas for funding. The feedback from the facilitators was that they felt that the MOOC asked a lot of learners, in terms of the number of steps where they were asked to contribute to discussions and Padlet, hence this may have impacted on lower participation rates in later weeks.

On the assumption that learners who create projects would share them, overall we feel that learning objective 2 was not fully met in terms of learners being able to co-create a smart cities project. Some learners would require further support beyond the timescale of the MOOC and one solution might be to set up a network outside of the course to provide ongoing support.

LO3) Share and discuss their views on smart cities as part of a global learning community

In total 7322 comments were posted during the first presentation by 727 social learners. The mean word count for comments was 63 words (standard deviation = 47 words) which suggests the discussions provoked meaningful conversations on smart cities rather than yes/no answers. Sharing and collaboration took place at a number of levels, with learners sharing their ideas, advice and website links through comments and by posting case studies and project activities on Padlet. The learner feedback suggests the MOOC has been successful at creating a cross cultural learner community on smart cities where collaborative problem solving takes place.

We plan further analysis to understand whether the social learners who complete the course are representative of the diverse international community who sign up to the MOOC. This is only possible for presentation 2 onwards as FutureLearn have now embedded an optional demographics survey within the platform so we can link demographic data with comments as both have an author ID code, which was not possible with the pre/post course survey data. Future research will also explore whether data analysis techniques such as topic modeling can be used to assess the learning objectives.

V. DISCUSSION

The first presentation of the Smart Cities MOOC was successful at attracting a diverse cohort of international learners in terms of motivation and demographics. Whilst MOOCs have the potential to provide access to those excluded from traditional universities, the majority of our learners are well-educated, typical of a FutureLearn learner [31]. Learner feedback suggests we were successful at creating a learning resource on smart cities that is relevant and meaningful to global learners. A particular strength was its people centered focus, which embraces community innovation and brings together a diverse range of people and views. We show that attracting a global cohort of learners brings a wide variety of cultural perspectives to the discussions, which provide a good way of scaffolding knowledge around smart cities as the community learn together; share ideas, discuss problems and offer solutions [23].

In terms of the educational materials the approach of learning through city case studies (videos and articles) was a particular strength, prompting good levels of discussion, although using existing video footage did mean the depth of the learning was limited at times. A less successful activity was the use of the Smart Cities Business Model Canvas, very few learners shared a completed canvas. The activities using it are focused in the final weeks and by this point learners probably felt overwhelmed with the level of social interaction required, so we need to review the use of this tool.

The major weakness of the MOOC is undoubtedly the high drop-out rate, which is likely to reduce the wider social impacts of the learning community. Whilst attrition rates are a common problem with MOOCs [31,32,33], a factor likely to have influenced this is the fact the course activities encourage a strong social presence. To address this we could reduce the number of discussion and Padlet steps and see what impact this has on course completion. Condensing the scope and length of the course might also help, as shorter courses tend to have higher completion rates [31]. We also plan to launch the course on OpenLearn, the OU's free online learning platform, and a future study will explore if the drop-out rates are lower when there is no pressure on the start and finish date.

Despite the low completion rate, satisfaction was high in learners completing the course and their comments provide us with a rich picture of an international citizens' views on smart cities. We plan further analysis of the comments using data analytics. Our results support the existing literature that suggests MOOCs can support citizens to learn about smart cities, helping them to develop new skills, competencies and ways of thinking [17,18], but identifies the fact that the impact could be limited if there is a high drop-out rate. Whilst engaging an international learning community creates a culturally rich learning environment, trying to meet of the learning needs of such a diverse cohort of learners does represent a significant challenge. One solution might be to tailor the MOOC to the needs of particular communities and explore course completion rates and the impact on the local community.

Our experiences suggest that teaching co-creation of smart city projects is particularly tricky within the timescale of a MOOC, due to the fact it requires time and effort to engage with community stakeholders, and some learners need greater support with project development than can be provided within a MOOC. An approach might be to adapt the course to meet the needs of individual cities that want to engage citizens in

their smart city projects and this could involve using a mix of online and offline activities. A city focused MOOC would need to bring together a critical mass of individuals from the same city and could be adapted to meet the specific learning needs of that city. The Smart Cities MOOC was developed as part of MK:Smart and features case studies related to Milton Keynes (MK). Learner comments suggest many of those from MK had not previously been aware of the smart city projects, in fact this was an issue raised by residents of many cities, which suggests that while smart cities recognize the need to engage citizens, awareness of projects is low. The MOOC has been designed to meet the learning needs of global learners, covering knowledge and competencies, but it could be adapted for individual cities' specific learning needs. For example we introduced learners to OurMK [34], a citizen ideas crowdsourcing platform for Milton Keynes. A common barriers the learners identified is that not everyone will feel confident in using online platforms and articulating their ideas on them. At the local level an idea to address this learning need would be to run workshops alongside the MOOC that bring residents together to explore the topics and supports them to feel confident about expressing their views and developing project ideas that could feed into OurMK and creates a local support network.

VI. CONCLUSION

The aim of this paper was to explore how a MOOC can be used to engage citizens in learning about smart cities and teach them how to co-create a smart cities project in their community. Evaluation of data collected from the first presentation of the Smart Cities MOOC suggests it was successful at attracting a diverse international audience who want to learn about smart cities and engages them in collaborative problem solving. Unfortunately the major weakness is the low completion rate, typical of MOOCs, which could limit the wider social impact. Despite this satisfaction was high in learners completing the course, with valuable insights for the ICT4S community on designing educational materials. We are using learner feedback to improve future presentations and think that the educational materials could be adapted to meet the specific learning needs of smart city initiatives. Course discussions also provide a rich picture of international citizens' views on smart cities and we plan to do further analysis of these and will also run the course on OpenLearn.

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