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Technology-supported Capacity Building on AMR Surveillance: Findings from the Pilot Phase

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The Open University

30 September 2019

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List of Acronyms

AMR	Antimicrobial Resistance
AST	Antimicrobial sensitivity testing
BOC	Badged Open Course
CME	Continuing medical education
CPD	Continuing professional development
DHSC	Department of Health and Social Care
FAO	Food and Agriculture
GLASS	Global AMR Surveillance System
LMIC	Low to Middle Income Country
MOOC	Massive Open online Course
ODL	Open and Distance Learning
OU	The Open University
OIE	World Organisation for Animal Health
SOP	Standard Operating Procedure
SRL	Self-Regulated Learning
ToR	Terms of Reference
UK	United Kingdom
WHO	World Health Organisation

Executive summary

Scope of the Report

Our ability to treat life-threatening conditions is threatened by the rise of antimicrobial resistance (AMR). Tackling the effects of AMR requires international collaboration, political commitment and partnerships to ensure that robust AMR surveillance can provide health intelligence data to inform evidence-based interventions at local, national and international levels. Strengthening AMR surveillance is a much greater challenge in weak health systems, as in low-to-middle income countries (LMICs), where the impact of infectious diseases is highest and the ability to respond to AMR may be limited.

As a response to the global threat of drug-resistant infections, the UK Government has established the Fleming Fund that plays a critical role in achieving the resolution of the 68th World Health Assembly, 2015 (WHA A68/20), and in realising the ‘Political Declaration of the High-Level Meeting of the United Nations General Assembly (UNGA) on Antimicrobial Resistance, 2016’. The work detailed in this report contributes to the Fleming Fund programme led by the Department of Health and Social Care (DHSC), specifically the objective overseen by Mott MacDonald to improve capacity in AMR surveillance in LMICs. This work is aligned with the World Health Organization’s Global AMR Surveillance System (GLASS), which acts as the blueprint for a multi-stakeholder global response to averting a global health crisis caused by AMR¹.

The Open University is the Global Learning Partner of the Fleming Fund Management Agent, Mott MacDonald. The OU has been appointed to develop and implement a programme that will help a range of stakeholders in Fleming Fund participating countries increase their knowledge, skills and understanding of AMR. As defined by the grant agreement between the Open University (OU) and Mott MacDonald, the Grant 1 (April 2018 to September 2019) supported the OU to develop and pilot an approach to delivering that programme. This work was carried out in two phases where evidence from Phase 1 Scoping (April – December 2018) informed Phase 2 Piloting (January – September 2019). An interim report submitted to Mott MacDonald in November 2018 summarised the findings of the scoping phase (see Annex 1) and outlines the approach to the piloting phase.

In this report, we draw on the evidence from Phase 2 in which the OU designed, developed and facilitated two pilot learning events in two target countries, Bhutan and Ghana: the first event was an 8-week online course, *Understanding Antibiotic Resistance*, and the second one was a 7-week blended event (online, face-to-face), *The Power of Data to tackle AMR*. This report will inform a longer-term approach to build AMR surveillance capacity in LMICs in a further Grant over the period 2019-2021.

¹ <http://www.who.int/antimicrobial-resistance/global-action-plan/en/>

Key Findings from the Pilot Phase

The learning events were an Open Online Course entitled *Understanding Antibiotic Resistance*, and a Blended Learning Event, entitled *The Power of Data to tackle AMR* which was partly online and partly face-to-face, focussed around specific workplaces. Each of these offered a distinct range of learner benefits that were realised through the learning design process adapted from the scoping phase. These benefits and the process are summarised below:

Learner Benefits Realised

- 1. Participation in each of the learning events increased appreciation of the scale of the challenge of AMR and the importance of the surveillance system.** In particular there was realisation that supporting AMR surveillance depends on people in diverse roles and on different sites working together within well-functioning networks.
- 2. There is evidence that participants appreciated better the role of the lab in the surveillance system after engagement in each event.** This is important because lab work is often perceived as being in the margins of the medical profession. Understanding that AMR surveillance work is valuable and can make a significant difference to a patient helps improve motivation for lab professionals within a human health setting.
- 3. Engaging participants in each of the learning events triggered a shift in perceptions of open, online and distance education (ODL) and increased acceptability of ODL as a form of quality education.** As expected, most participants had limited prior experience in online learning, but the evaluation provided evidence to show that participants have a better appreciation of the value of online and distance education. This included participants recommending the courses to colleagues and confirming their intention to continue engaging in online learning.
- 4. Participation in each of the learning events supported improvement in general knowledge about AMR and the AMR surveillance system.** Evidence generated showed an increase in participants' knowledge about AMR and development of a specialist AMR vocabulary, as well as an increase in their confidence in this domain.
- 5. The Data Event, designed around specific workplaces and participation in surveillance activity, enabled participants to learn about tools, techniques and practices appropriate to their role.** The majority of Data Event participants referred to specific techniques for AMR data analysis they learned through participation, while the senior lab people reported greater understanding of how to report and communicate AMR data results to their senior colleagues in the facility.
- 6. Through engaging in the learning events, participants incorporated inter- and intra-professional communication into their everyday actions.** Bringing together groups of individuals working in the same facility, as well as across facilities and sectors, helped people reflect on and change some ingrained professional practices. It also gave opportunity for inter- and intra-professional communication. This may be because participants had opportunity to interact with diverse groups of colleagues during the learning events. There was evidence that senior lab people identified possibilities for

surveillance improvements which were not previously aware. Some of these improvements might be relatively easy to implement, such as improved communication in clinical meetings, making sure test results were communicated in a way that was useful to the person receiving the data and so on. We have evidence that improvement actions have already taken place, for example review processes have been initiated with request forms for specific lab tests, processes for staff to request specific lab diagnostics to identify organisms that cause animal infections and so on. These improvements provide evidence of senior staff allowing technical staff to contribute more to overall improvements within the workplace.

7. **There is evidence of increased awareness of poor practice associated with AMR surveillance.** There was an appreciation that good surveillance practice relies on data flow across local, national and global networks. Participants reported they are more able to recognise and rectify poor practice within their facility and are more likely to take action to address this, such as the Lab scientist who reported they now check when data is missing and reports when it is inaccurate and the vet services professional who recognised that they and their colleagues' prescribing practices were not appropriate.

However, there are outstanding problems that need to be addressed in the next phase of work.

8. **Time, work responsibilities and Internet connectivity were barriers for professionals to take part and/or complete the two learning events.** These issues were raised repeatedly in the evaluation as reasons why participants could not spend more time in their learning, did not take part in certain activities (e.g. forum discussions, learning journal), or did not complete certain weeks of learning. A high percent of participants chose to study at their workplace only, due to having more reliable access to the Internet. Both events required high levels of commitment from the learners. For example, in the online course they were required to study for a minimum of 4 hours a week over eight weeks.

Learning Event Design Considerations

To realise the benefits outlined in the previous section, a number of design considerations had to be actioned:

9. **For learning to be effective, it was critical to consider the diverse perspectives of learners particularly from a work perspective.** The co-design approach enabled the work context to be an explicit consideration, supporting the design and implementation of learning events that were relevant and responsive to the needs of the target groups. It also allowed reaching out and working with target learners as well as individuals with strong expertise on AMR.
10. **A cross-functional, multi-disciplinary project team was crucial to the design and development of the learning events.** The importance of involving individuals from many disciplines within the development team was important. The co-design approach

involved a core project team consisting of people sharing a range of expertise such as learning experts, data experts, microbiologists, learning designers, development experts, production managers and educational researchers.

11. **Learner profiles, illustrating the characteristics of learners, proved a useful way to aid the design and development of learning events.** These profiles helped support consideration of who the learners are and how the learning events could be supporting them effectively in their roles in professional settings. This helped support the design of a flexible experience that led to high levels of student satisfaction.
12. **The mode of delivery of the learning events opened access to professional learning to people who have limited access to professional development opportunities.** For the majority of participants, this was their first opportunity to learn about AMR surveillance. Both learning events had positive feedback. The design of the Data Event enabled participants to learn with colleagues from their own workplace. This encouraged people to continue to communicate after the event and consolidate the learning.
13. **Support by in-country individuals was an important aspect of the recruitment of participants and also impacted upon the dissemination of information about the learning events.** Support from in-country professionals who worked closely with the OU research design team helped promote the learning events within specific facilities and provided support in the recruitment of participants, both during the learning events but also for the evaluation process.

Recommendations

Key recommendations have been identified to guide future work of the OU within the Fleming Fund. In consultation with DHSC and Mott MacDonald some recommendations have been prioritised and have been factored into design of Grant 2. Others are recommendations for the longer-term and possible subsequent grants.

1. **Create effective and flexible multi-disciplinary project teams to lead on the design and development of the various OU learning events.** Early planning is needed in terms of the roles and expertise required in the various phases of Grant 2, as well as good estimation of time and correct scheduling to allow for teams to be formed on time and lead the development, implementation and evaluation of modules / courses within Grant 2. Logistical support, especially within Objective 3, is critical and will be beneficial to identify in-country individuals in the five target countries to support work early in the process of Grant 2. Similarly, technical support is needed, and formal allocation of roles and time of individuals involved in specific phases (e.g. subject matter experts from Mott, academics, evaluators) as well as investment in initial co-located, face-to-face meetings as a project team will be beneficial in the development and implementation of Grant 2.
2. **Use a co-design process to design and develop learning events.** Co-design methodology brings together key stakeholders to inform the design of the learning

events. This process ensures that the events provide learning experiences that are responsive and relevant to the needs of the various target learners. The co-design process should be expanded to include other target groups beyond laboratory professionals, as identified in the ToR for Grant 2 (e.g. clinicians, vets, and nurses). More involvement of learners in all phases of the development of the learning events and their evaluation, and not only in early stages or summative assessments, is important.

3. **Create a wider set of learner profiles, illustrating the characteristics of learners, to include other professionals being targeted in the development of the curriculum and events.** In Grant 1 there was a requirement to focus on one particular profile of professionals. Grant 2 broadens the scope of the work to include clinicians, members of AMR committees, pharmacists, vets, animal health professionals, and other professional groups involved in AMR surveillance activity. It aims to reach a wider group of professionals in surveillance networks, therefore there is a need to consider development of evidenced-based profiles for learners beyond lab professionals, as identified in the ToR for Grant 2.
4. **Expand the range of learning events to include further opportunities for online, blended and distance learning for professionals in AMR surveillance.** In the context of Grant 2, the two existing learning events should be re-used or re-purposed. This provision should be expanded and complemented with additional curriculum and learning events around key priority areas and knowledge gaps identified in the Scoping Phase in ways that will increase access to learning opportunities among professionals.
5. **Design learning events that aim to bring a change in professional practice.** The Fleming Fund has a great opportunity to accelerate impact on professional practice by ensuring that work practice and work contexts help inform the development and implementation of curriculum. There should be particular attention given to offering opportunities for professionals to collaborate and engage in inter- and intra-professional communication.
6. **Consider the provision of shorter modules and courses to accommodate professional responsibilities among professionals.** There is a need to create modules that can be completed in a shorter time with micro-credentials as rewards upon completion. For example, the Online Course *Understanding Antibiotic Resistance* could be broken into three distinct micro-modules that are 2-3 weeks in duration and require, 2-3 hours study per week. Micro-credentials could be linked together through specific learning pathways, such as a Foundations in Microbiology pathway. Similarly, the event *The Power of Data to tackle AMR* could be offered as three micro-modules covering Introduction to Data, Data processing in a Facility and Data presentation and reporting (each 2 weeks with 2-3 hours study per week).
7. **Formalise partnerships with local or regional institutions to support the sustainability of learning event provision.** To increase the uptake of learning and

ensure longer term sustainability, support should be given to local organisations to run and own the learning events enabling them to be adapted to a variety of work-based contexts. This would involve working with Fleming Fund country and regional Grantees and Host Institutions to identify partners who may be sub-contracted to help deliver some of the objectives of Grant 2.

The following recommendation, though not prioritised within Grant 2, should be considered for longer-term, subsequent grants.

- 8. Create opportunities to work with local organisations to provide accreditation for the modules/courses offered.** It will be beneficial to work with local authorities and bodies such as the Ministry of Health and the Ministry of Agriculture or local universities to fully endorse and recognise the online provision. This could be in the form of Continuous Medical Education (CME) credits that as identified in the Scoping Phase are essential within medical professions and may bring greater recognition and acceptance of the OU online learning provision.

1. Introduction: Overview of the Fleming Fund

The Fleming Fund is the UK Government's investment to help low- and middle- income countries (LMICs) fight antimicrobial resistance (AMR) by improving surveillance. The Fleming Fund Grants Programme is the largest workstream within the Fleming Fund. Mott MacDonald is the appointed Management Agent for the Fleming Fund Grants Programme. The aim of the Grants Programme is to improve the ability of recipient countries to diagnose drug-resistant infections, and improve data and surveillance to inform AMR policy and practice at national and international levels. The geographic focus of the Fleming Fund Grants Programme is 24 LMICs from Sub-Saharan Africa, and South and South-East Asia. Support to participating countries is provided through three funding channels: Country Grants; Fleming Fellowship Scheme Grants; and Regional Grants,

The Fleming Fund's emphasis on AMR surveillance requires a particular focus on the professional practice of a wide range of individuals with a variety of skills, backgrounds and interests, including laboratory staff, public health professionals, policy makers, clinicians and nursing staff, veterinary professionals and agricultural workers, and pharmacists. There is an urgent need for these professionals to learn about good practices associated with AMR on a mass scale, with accessible learning materials for knowledge and skills development.

2. Background to and Objectives of the OU Grant 1

The Open University (OU) is Mott MacDonald's Global Learning Partner for the Fleming Fund. The OU was awarded a grant (Grant 1, April 2018 - September 2019) to develop and pilot an approach to address the large-scale learning needs of the Fleming Fund programme.

The primary aims of Grant 1 were to:

- a) Identify the skills and knowledge needed by different groups of professionals working in AMR surveillance systems in LMICs.
- b) Design, implement and test two different learning events for two groups of these professionals.
- c) On the basis of the lessons learned, to design an approach to meeting the needs of the different professional groups that could be implemented in a subsequent grant.

The work was carried out in two phases where evidence from Phase 1 Scoping (April – December 2018) informed Phase 2 Piloting (January – September 2019²). Through consultation with Mott MacDonald, three countries were identified as OU target countries in Grant 1 by taking into account their involvement within the Fleming Fund. These were Bhutan, Ghana and Tanzania.

² Grant 1 had originally been intended to finish in June 2019, but a no cost extension was granted when it became apparent that the piloting process was more complex and lengthier than originally anticipated.

The OU's November 2018 scoping report, drawing on evidence from the Scoping Phase, highlighted a number of priority themes, target groups and 'knowledge gaps' that need to be addressed to effectively tackle AMR at country level. The OU's report also identified a widespread demand for information on AMR across in the 'One Health' disciplines – a finding that reinforced the management Agent's experience from designing the Country and Regional Grants (see Annex 1).

Drawing on these findings and recommendations, Phase 2 (January 2019 - September 2019) involved the design, development, piloting and evaluation of two learning events to support the development of knowledge and skills about AMR and change in work practice among professionals in AMR surveillance networks in the three target countries.

The two learning events that were developed in Phase 2 were:

1. Open Online Course, *Understanding Antimicrobial Resistance* (8 weeks)³, launched on 1st May 2019.
2. Blended course, *The Power of Data to Tackle Antimicrobial Resistance* (7 weeks)⁴, launched on 27th May 2019.

A description of the two learning events is provided in Section 5. The face-to-face workshops for the second event took place in Ghana in the first week of July 2019. Both courses were hosted in the OU platform OpenLearn Create and are still available on this platform. For the purposes of the evaluation, the focus of the Online Course was Bhutan and the focus of the blended course was Ghana. Even though the Online Course was potentially open to participants in Tanzania and Ghana (and globally), in-country logistical support had to be in place to support enrolments on the course. However, this was not possible within the Pilot phase. Furthermore, due to time and budget restrictions, the face-to-face workshops as part of the Data Event could only take place in one location. As a result, a decision made in early stages of the evaluation design was to limit the scope of the evaluation to one country for each event. Ghana was selected for the Data Event as it was one of the early engagement countries in the Fleming Fund.

This report draws on evidence generated from Phase 2 to examine the development and implementation of the two learning events, as well as the benefits they had on participants taking part in those events. This report will inform a longer-term approach for the OU to build AMR surveillance capacity in LMICs in a further Grant over the period 2019-2021.

3. Methodology of the Design, Delivery and Evaluation of the Pilot Learning Events

Phase 2 involved three integrated activities: Co-design, Delivery and Evaluation.

³ <https://www.open.edu/openlearncreate/course/view.php?id=3941>

⁴ <https://www.open.edu/openlearncreate/course/view.php?id=3964>

Co-Design: The co-design was informed by a number of factors that influence the learners' participation in each learning event. This involved understanding of the reasons why participants wanted to learn about AMR and AMR surveillance, identification of characteristics of their work environment, as well as specific prior arrangements needed to enable online study (e.g. professional development needs, access to the internet, prior experience of professional development, expectations of the learning event). This stage also included an examination of learners' perspectives on preliminary learning materials that the OU was creating as part of the two learning events. This took place through in-depth individual interviews with professionals (n=9) across the three countries (see Section 3.1). This stage directly fed into the learning design and development of the two learning events.

Delivery: The second stage focused on the delivery of the two learning events and involved the development of the curriculum and of the learning activities, getting technical support to ensure the quality, as well as logistical support to facilitate the enrolment of learners in Bhutan and identification of specific workplaces in Ghana. This stage is directly related to the third stage, which focused on the evaluation of the two events.

Evaluation: The learner experience and the design team experience were evaluated between February and August 2019. Learner experience evaluation data was gathered through pre- and post- surveys distributed to all participants across both learning events. This was followed by in-depth, individual interviews with twenty participants across both events (n=20), as well as monitoring of learning through data analytics from data gathered by the online learning platform (Section 3.2 and 3.3). Evaluation examined a) the experience of the participants and b) the impact the learning events on their work.

Design team experience evaluation involved team-based reflection to examine the design and facilitation processes in Phase 2. Evaluation was facilitated through fieldnotes recorded by the lead evaluator of team in reflective discussions during project meetings. This methodological approach was important and supported reflection on the OU design team's own practices around the design, development and piloting of the learning events. Our methodology informs the approach that the OU will take in a subsequent Grant aiming to improve the design, facilitation and evaluation of learning events aimed to change the practice of professionals in LMICs.

Ethical approval of the evaluation work was overseen by the OU Research Ethics committee (REC/3258/Charitonos) and followed the University's ethical guidelines.

3.1 Participants in the co-design stage

The co-design stage took place between January and March 2019. Data were gathered between February and March 2019 using in-depth interviews with nine professionals (n=9) in the three target countries (n=7 male, n=2 female; aged between 28 and 59 years). Analysis of this data is presented in Section 4.1. Table 1 illustrates the participant profiles.

Table 1 Profiles of professionals in the initial co-design stage

Country	Number	Roles	Sector
Country 1	5	3x Senior Lab 2x Lab professionals	2x Human Health 2x Food/environment 1x Animal Health
Country 2	1	1x Senior Lab / AMR Expert	1x Human Health
Country 3	3	3x Senior Lab	2x Human Health 1x Animal Health

As part of this process, the OU team worked with Mott Country office staff and key personnel from each country (see ToR in Annex 2) to recruit individuals for a meeting with the lead OU evaluator in the OU Team. Recruitment for these meetings reflected the target groups of learners in each event. As a result, lab professionals and senior lab professionals (e.g. in Bhutan) were approached as well as individuals holding senior positions within the surveillance system (e.g. in Tanzania and Ghana), as per the aims and objectives of the two events. Initial invitations were sent to fifteen (n=15) individuals (6x Bhutan, 3x Tanzania, 6x Ghana). Of these, nine (n=9) accepted the invitation and took part in one-to-one meetings (either online or on the phone).

During the meeting, these professionals were asked about their motivation for learning, their work environment, areas of interest for professional development but also to suggest improvements at initial course materials and learning activities that the OU team had developed⁵. Specifically, they were asked to go through a proposed course outline. They also commented on examples course content resources and activities that could be included in the course. They were asked how useful these resources and activities would be. Finally, input was sought on certification that would be awarded upon completion of the course

On average, each meeting lasted 53 minutes and notes were taken by the researcher during the meeting.

3.2 Evaluation of the pilot learning events

3.2.1 Evaluation of the Open Online Course

The Open Online Course was launched on 1st May 2019 and was completed on 26th June 2019. Evaluation data related to the Online Course were gathered between May and August 2019. Analysis of this data is presented in Section 6.

⁵ Materials shared with participants prior to the meetings:
Open Online course - <https://bit.ly/2m9ARYY>; and Data Event - <https://bit.ly/2m4dY9f>

Monitoring of learning through data analytics from data gathered by the OpenLearn Create platform took place throughout the delivery of the course.

Online surveys were distributed to the course participants prior to the start and after completion of the course (see Annex 3). These surveys were available through the OpenLearn Create platform so participants could complete them online. Reminders to complete the surveys were sent via email and forum posts. In total, 26 participants completed the pre-course survey and 8 completed the post-course survey.

The survey responses were followed up by individual interviews with course participants from Bhutan. As in previous phases of our work, we worked with an in-country coordinator in Bhutan to support the recruitment of interviewees. In total twelve (n=12) participants working in Animal or Human Health sectors were interviewed (Table 2). Interviews were carried out either by phone or online via Skype. Course enrolment data shows that more professionals from Animal Health participated in the learning event compared to Human Health. On average, each interview lasted 35 minutes.

Table 2 Profiles of interviewees in the Online Course

Role	Sector	Numbers
Lab professionals	Animal Health	2
Lab professionals	Human Health	2
Vet Services Professionals	Animal Health	8

The process to recruit interviewees was as follows:

- First, email invitations were sent to the people who responded positively to the invitation included in the post course survey (final question Instrument B - see Annex 3).
- Secondly, invitations were sent to participants who followed-up on an email by the OU team on 24 May 2019 seeking feedback.
- Finally, invitations were sent to participants depending on their role and participation or non-participation in the course.

Of the twelve people interviewed, nine were recorded and transcribed verbatim. Three were not recorded due to interviewees not providing consent for these to be recorded. For these three interviews, notes were recorded by the researcher. The interview sample included two professionals who enrolled but did not start the course because of time limitations. Additionally, three participants who had not completed the course at the time of the recruitment for the interview reported on completing the course in August 2019.

3.2.2 Evaluation of the Data Event

The learning event *The Power of Data to tackle AMR* was launched on 27th May 2019. Evaluation data related to the Data Event were gathered between May and August 2019. Analysis of this data is presented in Section 6.

Two human-health facilities were selected to recruit participants for the Data Event (Site 1 and Site 2). Both facilities are located in an urban environment and are part of the Surveillance Network system that has been established in Ghana. Participants numbers were restricted to 12-15 participants in total because the learning events included face-to-face workshops at a facility.

The Mott MacDonald office in Ghana involved key gatekeepers within the facilities in the dissemination of information about the Data Event. The office also helped with the recruitment of participants. Fourteen participants enrolled on the blended course: ten from Site 1 and four from Site 2. All but one based in the labs (one clinician). Out of the fourteen enrolments on the course, eight people in total participated in the face-to-face workshops that took place in Ghana in July 2019 (all based in the labs). Two members of staff from the Management Agent as well as the Fleming Fund country lead also attended the workshops.

Table 3 Roles for interviewees in Data Event

Site	Number	Roles
Site 1	5 participants	1x Senior Lab professional / manager
		4x Lab professionals
Site 2	3 participants	2x Senior lab professionals
		1x Lab Professional

All participants of the face-to-face workshops were invited to participate in individual interviews (n=8; n=6 male, n=2 female). These interviews took place the week following the workshops (8 - 15 July 2019) on each of the two facilities. On average, each interview lasted 20 minutes. Another interview with the course facilitator was conducted in August 2019⁶. All interviews were recorded and transcribed verbatim. Table 3 below shows the Data Event interviewees and their profiles.

Analytics were also collected through the OpenLearn Create platform for the online part of the Data Event. In addition to this, two surveys were distributed to the course participants prior to the start and after completion of the event (see Annex 3). Reminders to complete the surveys were sent to participants through emails and forum posts. Surveys were included in the

⁶ At the time of writing this report the transcript of this interview is pending.

OpenLearn Create platform. Twelve (n=12) participants filled the pre-course survey electronically. A paper-based version of the survey was distributed to the participants during the face-to-face workshops and were collected by the researcher after the interviews (n=8).

4. Co-design Approach to Developing the Pilot Learning Events

During Phase 2 (January 2019 – September 2019), the learning events were designed using a co-design methodology. Co-design brought together professionals in AMR Surveillance systems (target learners), subject matter experts, learning designers, online editors, TEL and educational researchers, and development officers to co-design learning events that respond to the learners' needs (from Phase 1) to maximise the impact of the learning events on work practice. The aims were:

- to enhance the validity of the design of the learning events (ideas, concepts, approaches, activities);
- to identify how best to support the learners in transferring the concepts they learn about different forms of data into their work practice;
- to identify learning activities that would support lab professionals in considering how their workplace could be restructured to support AMR surveillance;
- to draw on the expertise of various stakeholders, namely professionals' content knowledge, workplace practice, learning, technology use, to develop the learning events;
- to establish a learning community, both for online and offline (physical) learning spaces;
- to create 'learning events' that blend learning with work
- to promote work practice that is blended into 'formal curriculum' to foster a cross-space ongoing learning process among the professionals (i.e. learners).

The co-design process was operationalised throughout Phase 2 by:

- a Learning Design Team (i.e. researchers, subject matter experts, learning designers, editors, media producers, professionals) to progressively design, develop, facilitate and evaluate the two learning events in LMICs.
- Cycles of 'design – adapt - align – test – reflect - refine' process carried out by the researchers with target groups of learners and others in the Learning Design Team.
- Design based upon: Domain Knowledge / Curriculum – Learning processes and approaches - Professional Practice in the Workplace - Profiles of Learners – Supportive Technology.

4.1 Use of Learner Profiles for the pilot learning events

In Phase 2 we developed profiles of learners to inform the design of the learning events. These profiles were based on target learners in professional settings in low-resource contexts. The profiles were developed by engaging prospective students/professionals through in-depth individual interviews in the co-design stage using the instrument illustrated in Annex 2. These learner profiles provided representations of the target professional learners. The profiles were an aid to learning design of the pilot events and their use ensured that the pilot events were designed with these professionals in mind, and that the learning activities, content and technology tools would meet the needs of these learners. An example is provided in Figure 1.



1. Name	2. Age	3. Work Role
o	40	Principle Biomedical scientist (Ghana)

4. Studying in English How confident are you in studying in English? (1-4) (1) Highly (2) Mostly (3) Slightly (4) Not very	5. Using computers and the Internet How confident are you in using computers and the Internet? (1-4) (1) Highly (2) Mostly (3) Slightly (4) Not very
6. Understanding of AMR How confident are you feeling about your current understanding of Antimicrobial Resistance AMR: (1) Highly (2) Mostly (3) Slightly (4) Not very	7. Managing your own learning How confident are you about managing your learning? (1) Highly (2) Mostly (3) Slightly (4) Not very

8. Motivation

What I like about my job is to be able to achieve (Identify?) a specimen and is suggestive of something and in the end of the day I'm able to come up with organism and antibiotics. I'm really happy when someone is feeling better as a result of what I've done. I feel very bad when we see samples, sample that is showing that a patient is sick, do the test and (you call and they are gone ?) and I feel very bad. I always want to be able to help them identify what's wrong with the patients as much as I could. This is what motivates me to do my work.

9. Work Environment and planning for learning

I choose what I want to learn about my work. Nobody forces you to learn. I have to inform my boss, and head of lab and the management here. just a meeting with them, give reasons why. They ask questions why you want to do this. For the OU course, I inform HR director, inform my manager. For an online course I don't need to as it's your own time. But it's them being aware that it is happening for my work and I'm taking part. WhatsApp platform, we discuss issues. This is a group that was formed with participants from bacteriology

10. Technology in the workplace

I have access at home. Not able to use internet at work, we have computers but they are not connected to the internet. I bring my own laptop. Connect this to my modem (carry this around). Not every day, when I want to use it to do I bring it at work. Mobile phone: internet access. Use it a lot!

12. Location and Time for learning

For me is going to be mainly at home. Maybe at work - for example 12pm in the afternoon -2pm we are done with most of the things and place is quiet. Most of work is done in the morning. Sometimes I can study at work. 3 times a week is Ok for me, 1h or 2h is OK

Any other details you would like to share.

11. Past Learning Experiences (incl. online)

Example from a course I took. University of Ghana. 2 years course. Topics to do research and present back and choose the target group. Response of patients to organisms. I signed up for this because I wanted to improve my knowledge on microbiology in general. Went for a course MPhil in Microbiology. We had a lot to create. A lot of assignments, electronic forms. Learning on your own. You come for discussions. I spoke with senior colleagues about the value of this, a cousin of mine working here and my husband. We had to take exams where we were assessed. Research work we did. I had a mentor from university of ghana - my supervisor. Support from family. We used laptop a lot, internet

13. Future learning experiences

I'd like to imagine a training environment where you have patients you are dealing with and then you follow patients up to the hospital ward environment, see how they take their drug, what they are exposed to, what is needed to continue their medication, what's causing the resistance, how they respond to. But it's not really ending at the hospital. A follow-up on the patient later, know how they end-up, if they are ok, what they are exposed to in their environment. What is causing their condition, why they are not responding to treatment, if you change treatment. I'd like to interact with medical officers managing the patient doctors and the nurses at the word if it's in-patient.

14.

we don't do a lot of research happening at my workplace. And is something I'd like to encourage. We don't follow-up and analyse the data. Something that we don't do much. I'd like this to be part of our work. We give results to the doctors, we don't know what's happening to the patient. We don't analyse the trends/patterns of antibiotic resistance. We just notice that some antibiotics are becoming resistant. Don't do the scientific aspects and coming out to present this in the hospital. We know that resistance is increasing but we don't follow why this is happening

Figure 1 An example of a learner profile generated in the co-design phase

4.1 Key Insights

The following section presents some key insights from the co-design stage and implications for the design and development of the pilot learning events. Due to time and budget restrictions the OU team had to prioritise which aspects to consider in the development of the pilot events. These are highlighted in bold in what follows. Despite not considering some of these in the pilot phase, these will be taken into consideration in subsequent grants. Nine participants were involved in the co-design through one-to-one in-depth interviews with the lead researchers.

Background

Participants appeared 'highly confident' (n=5) or 'mostly confident' (n=4) in studying in English (Item 1, Table 4), with similar ratings received in the question about managing their own learning (Item 5, Table 4). Ratings varied slightly in the question about confidence in using computers and the internet, with a few (n=2) choosing the response 'slightly confident'. In terms of their perceived confidence in their current understanding on AMR, most participants stated that they are 'mostly confident' (n=6) (Item 3, Table 4).

Implications for the OU Pilot Learning events:

- **Courses in English might be acceptable;**
- *Support on how to study online might be required.*

Table 4 Perceived confidence among participants of the co-design phase (N=9)

	Questions	Responses				
		Highly	Mostly	Slightly	Not very	Not at all
1	How confident are you in studying in English?	5	4	-	-	-
2	How confident are you in using computers and the Internet?	4	3	2	-	-
3	How confident are you feeling about your current understanding of Antimicrobial Resistance AMR?	1	6	2	-	-
4	How confident are you feeling about your current understanding of Antimicrobial Resistance AMR?*	2	1	-	1	
5	How confident are you about managing your learning?***	5	3	-	-	-

*This question was asked to the four participants for the data event

** Eight responses out of nine received

Motivation and expectations from taking part in the OU course

All nine participants were positive about their job. A few referred to the role as challenging and one described it as consisting of routine activities. Their motivation to enrol on one of the OU courses was primarily to help improve lab diagnostics in their facility. Specifically, they wanted to advance their knowledge on AMR, to gain an understanding of what causes AMR resistance, how to do AST and how to identify organisms and antibiotics. The ones based in a human

health facility, they viewed their participation in the course as a way to provide better support for clinical treatment and to contribute to patient care.

Implications for the OU Pilot learning events:

- ***In the course content include information about AST tests and the surveillance system;***
- ***Highlight the importance of lab diagnostics for clinical treatment and patient care in examples regarding human health sector.***

Processes for taking part in a professional development programme

Participants perceived it was their responsibility to decide what they needed to learn, and identify professional learning opportunities. Once they have identified a programme, and depending on their role, they apply formally to their line manager and the facility administration who review and plan their learning needs. The process involves submitting a request to be released from their duties for the duration of the proposed programme and therefore has to be submitted well in advance of a programme (e.g. a month). The employee has to justify why the programme fits with organisational needs and is appropriate for their role. If the programme is not free of charge, the employee has to secure funds. Thus, there are major barriers to participation in professional learning: one a participant told us he had to wait six months after learning in a programme before he would be considered for involvement in another programme. However, the selection process is more flexible for people with a more senior role in the facility (managers, supervisors). All participants said that distance and online learning does not require formal approval, because learning can take place in the lab and does not involve travel. They would simply have to inform their manager.

All participants were very aware of their contractual requirements for their role in the public health sector. On an annual basis they need to submit evidence of their continuing medical education (CME), submitting evidence of credits accrued to the national authorities. It would, therefore, be helpful to award CME credit through the OU learning events.

Participants reported they usually find out about professional development programmes through 'word of mouth' and WhatsApp groups seemed to be the most prominent ways.

Implications for the OU Pilot Learning events:

- ***A formal organisational process might not be required for enrolment on an online course;***
- ***In Introductory content to the events, highlight benefits from participation to support any discussions the learners might have with their managers;***
- *Consider offering CME credits upon completion of the two events;*
- ***In-country support for promoting and disseminating information for the courses is required.***
- *Email communication might not be the most appropriate channel of communication with the learners.*

Technology and Internet connection at the workplace and at home

All the participants use their own mobile phones and they have internet access on their phones. A participant noted that charges for data are too high in Bhutan, hence it is prohibitive to use mobile phone for large files (e.g. videos). A few said that they do not have access to a computer or the Internet at home, and they usually use the facilities at their workplace. Indeed, the majority (n=7) reported that they have access to a computer and reliable internet connection at work. Two participants in Ghana whose facilities do not provide access to the Internet reported that they made their own arrangements through a personal modem and personal laptops.

Implications for the OU Pilot Learning events:

- ***The location for studying online on an OU course is likely to be the workplace;***
- *The learners might experience difficulties to watch / stream large video files.*
- *Consider reducing the size in large files, for example by providing animated videos;*
- ***Provide downloadable materials as equipment at work might not be accessible at all times;***
- *Make resources mobile-friendly.*

Time and Location for study

All the participants were working from Monday to Friday, without any shifts during the weekends. The majority explained that during work hours they would be unlikely to be able to work on a course due to time restrictions, especially if they are engaged elsewhere (i.e. outside the facility). A usual day for them starts early morning and finishes in the afternoon. The ones that were based in a hospital, highlighted that mornings are very busy, but it becomes quieter after 2-3pm in the afternoon. For a few, Fridays are usually quieter, hence they said they could be spending more time on their studies. Most expressed willingness to stay at the facility after work for a few hours to work on the course or over the weekends. When asked to estimate how much time they could spend on the course per week, responses ranged from 1h to 3h per day to 1h to 2h three times per week. Participants seemed to respond positively with the proposed duration of 7/8-week long courses.

Implications for the OU Pilot Learning events:

- ***The location for studying online on an OU course is likely to be the workplace;***
- ***Consider any communication with learners before Friday;***
- ***A course duration of 7-8 weeks seems to be well received for this particular group.***

Preferred learning situations and activities

Participants were asked their views about how they would like to learn in the learning events. For learning to be useful it has to be aligned with everyday activities they carry out in their daily work. They found it useful to learn both conceptual and practical knowledge, for example taking samples in a ward, revising SOPs and incorporating new methodology in bench work.

Learning activities should:

- encourage collaboration, sharing of knowledge and interactions with peers and senior colleagues, not only within one facility but across facilities nationally.
- support interactions with experts in the field, specifically experts in bacteriology, clinical microbiology, statisticians, and medical bacteriology field. These experts could be from their country and abroad.
- offer opportunity to work with people who have used and analysed AMR data before. Participants would like to see cross-sectoral interaction (e.g. human health – animal health) and intra-professional interactions. For example, more interaction with clinicians and medical officers were requested to learn how to work closely together to monitor patients' treatment.
- build a community of online mentors to help build knowledge about AMR.

When asked their views about how they would like to be assessed in the learning events, participants suggested presentations to colleagues (e.g. in clinical meetings), carrying out lab tests and writing reports and assignments. The participants wanted these assessments to lead to a certificate of completion from a recognised university or to be awarded CME credits for participation.

Implications for the OU Pilot Learning events:

- ***The Learning Design should make strong links with existing work practices;***
- ***The events should include activities to enable inter- and intra- professional interactions;***
- ***Integrate quizzes in the two events as a way to review and/or assess factual knowledge;***
- ***Presentations or small assignments seem to be well received by this particular group;***
- *Consider offering CME credits upon completion of the events;*
- ***Organise learning for groups of learners within the same facility involved in surveillance activity;***
- ***Provide additional resources to complement the core course content.***

Appropriateness of the content materials

Participants were asked to go through a proposed course outline. They also commented on examples course content resources and activities that could be included in the course. They were asked how useful these resources and activities would be. Finally, their input was sought on certification that would be awarded upon completion of the course.

All participants strongly agreed that the course would be relevant to their job and that they would be likely to register for the course. They were invited to comment on several types of learning activities: multiple-choice activity, a reflective activity and a forum activity. All these activities were viewed as useful. Most participants stated they were comfortable with most activities and indicated that is likely or very likely to take part in these when asked. When asked about the type of certification upon completion of the course, the preferred type was a certificate and a badge with the OU logo.

One participant in particular, in providing her input about the Data Event, prompted us to consider the type of the workplace that this course was going to be offered to, because in her view the level seemed to be quite advanced for specific lab professionals in regional / rural facilities. When asked her view on the suggested target groups (e.g. lab professionals, clinicians, senior management), even though she agreed that these target groups are essential, she questioned how relevant this would be for clinicians. She prompted us to consider how the content could become more relevant for clinicians. For example a clinician will be interested to know the concept of AMR, why is important to give guided therapy, why is important for them to order tests and respond to lab diagnostics. She also suggested considering another group to be included in the target groups, namely medical microbiologists, who are a key group for AMR stewardship.

Implications for the OU Pilot Learning events:

- ***A certificate and/or badge with the OU logo seems to be the preferred option;***
- ***Include a range of activities in the two learning events, for example assimilative, interactive, reflective activities.***
- *Send an invitation to medical microbiologists for the Data event;*
- *Consider adaptations of the content to suit clinicians.*

5. Delivery of the Pilot Learning Events

The learning events drew on these key findings in the following ways:

Table 5 Response to key findings from the scoping phase in the learning events

Key findings	Response
Opportunities for sustained professional development are limited.	Learning events were offered free of charge on an online platform under a creative commons license.
Laboratory professionals at all levels require opportunities for capacity building.	<ul style="list-style-type: none"> • The Online Course was designed to be accessible to, and relevant to laboratory practice across sectors. Additional activities were included which refer to reviewing current laboratory tasks. • The Data Event targeted laboratory professionals and included examples from lab AMR data.
Foundations in microbiology, Data use and Interpretation and Communication, Collaboration and Advocacy were the three top priorities of nine priority areas of knowledge needed by professionals across animal and human health sites.	<ul style="list-style-type: none"> • The Online Course was responding to the priority area 'Foundations in Microbiology'. Content was adapted from an existing course to be relevant to LMIC contexts. • The Data Event was responding to the priority area 'Data use and interpretation in Clinical Services'. Content was created to be relevant to current lab and clinical services practice. • Both events responded to the priority area 'Communication, Collaboration & Advocacy' by following learning design and including content to address human health and animal health sector needs (Online Course) and targeting professionals in various roles (Data Event).
A lack of clarity as to what constitutes surveillance practice and One Health.	Both events included content about surveillance networks, including activities for participants to reflect on their role in such networks. Inter-professional discussion was encouraged through course forums as well as in the face-to-face workshops in the Data event, and activities which encouraged discussion with colleagues in the workplace. Content included information about the One Health, aligned with the approach taken within the Fleming Fund. Especially in the Online Course examples provided drew on multiple sectors and encouraged participants to consider and share practice from their own sector.
Within existing AMR (or health system) structures in LMICs analysis systems are failing to routinely deliver or offer opportunities for professionals to engage with one another.	Both events were designed to encourage a range of participants from the same sector (Online Course, Data Event) or across sectors (Online Course), and from different facilities or from the same facility to participate in the events to strengthen their capacity. The design and activities included encouraging discussions and sharing of information about their practice. Specifically, the Data Event was designed to enable inter- and intra-professional communication by targeting people in various ranks and roles across lab and clinical services.

The introduction of AMR surveillance practice requires restructuring of work.	Both events were designed to encourage a range of participants from the same setting to participate in the events and use this as a basis from which to discuss the implications of their participation with colleagues to review current provision and plan some actions to bring change in their workplace. Especially for the Data event a key design decision was to target a specific facility and bring various people holding different roles together.
There is extensive use of digital and online technologies	Technology to undertake an online course was assumed not to be a barrier to participation and learning.

The Data Event and the Online Course each served a different purpose and, therefore, were designed in different ways. There were four important differences between the Data event and the Open Online Course, as follows:

- I. the Online course was open to anyone, whilst the Data Event was open only to specific individuals that were recruited from two sites in Ghana⁷. As a result, the Data Event targeted colleagues involved in surveillance activity (lab, clinicians, senior management) and all based within the same facility. In the Online Course this was not required.
- II. the Data Event was designed to be relevant to specific workplaces and was based on participation in surveillance activity (AMR analysis, interpretation and communication). During participation participants would reflect on their current ways of working, including the organisational processes and structures, and deciding change needed in the organisation. The Online Course on the other hand, was designed around individuals, their work roles and foundational knowledge required about AMR.
- III. the Data Event focused specifically on Human Health, hence both target sites were facilities in human health sector. The Online Course targeted professionals across sectors, hence it included content and activities to address a multi-sectoral approach;
- IV. the Data Event incorporated two weeks of learning as two face-to-face workshops / tutorials due to its aims and objectives. The Online Course was delivered online only.

5.1 Online Course *Understanding Antimicrobial Resistance*

5.1.1 Description – Online Course Design

The Online Course *Understanding Antimicrobial Resistance* was produced by repurposing material from an existing OU course *Understanding antibiotic resistance - a Badged Open Course (BOC)* available from the OpenLearn platform⁸. Table 5 illustrates how this BOC was adapted to for the Fleming Fund work.

Understanding Antibiotic Resistance, involved 32 hours study spread over 8 weeks. The course introduced the science behind the problem of antibiotic resistance. It covered the history of antibiotics, what they are and how they work. Participants had opportunity to learn how antibiotic

⁷ This was done through an enrolment key that was sent to specific individuals recruited from the two sites.

⁸ <https://www.open.edu/openlearn/science-maths-technology/understanding-antibiotic-resistance/content-section-overview?active-tab=description-tab>

resistance develops and spreads and could reflect on the issues surrounding antibiotic resistance. Finally, the course illustrated how and why scientists track antibiotic resistance. The course design encouraged participants to consider how their learning related to their work.

Although this was an introductory course, it assumed participants had a basic understanding of biology, specifically DNA and protein structure and function. There were opportunities for participants to monitor their learning through interactive quizzes and activities, and learners were encouraged to reflect on their learning at the end of every week. They could participate in online forums and record a learning journal to track how their learning related to their work and a template and guidance for this were included as a downloadable resource. At the end of the course participants prepared a report for their colleagues to outline what they had learnt. An OU academic and a subject-matter expert from Mott jointly monitored participation in the Online Course.

The learning outcomes of the course were as follows. On completion of the course participants would be able to:

- describe what antibiotics are and how they work
- explain how bacteria become resistant to antibiotics
- outline the basic principles of antimicrobial resistance
- describe how antibiotic resistance relates to their work
- describe how their work fits in with wider national and global antibiotic resistance priorities
- identify terms related to AMR, and be able to use these with confidence in their everyday job and interactions with others.

At the end of this course participants could receive a statement of participation. To be eligible, participants needed to make forum posts in weekly, signposted activities.

Examples of activities included:

- Drag and drop exercise - to match descriptions of bacterial growth to a growth curve diagram (Activity 1);
- Reflections on content to prior experience or learning from the week – to reflect in their learning journal on whether their work relates to any of the named bacterial pathogens, what other pathogens they encountered in their work, whether they knew what infections they caused. These include encouragement to research using the internet or talk to colleagues about the questions (Activity 2 and Activity 9);
- Short quizzes to pre-test knowledge, with answers available to be revealed (Activity 3);
- Watching videos or listening to audios with questions to consider (Activity 4);
- Reading of short articles with questions to consider (Activity 5);
- Interpretation of data/figures (Activity 6).

5.2 Blended Learning Event *The Power of Data to tackle AMR*

5.2.1 Description - Event Design

The event, *The Power of Data to tackle Antimicrobial Resistance*, was designed for 30 hours study over 7 weeks. The course was designed for professionals in diverse roles from within the same facility (e.g. laboratory scientists, lab managers, clinicians and senior management in the hospital). Table 5 illustrates how the course was designed in accordance to key findings from the Scoping Phase.

The event followed a blended learning approach, with 5 weeks of online study and 2 weeks of face-to-face learning (delivered over 2 days of face-to-face workshops). Participants could work through the online resources at their own pace, but they had to take part in a two face-to-face workshops in Ghana during course Weeks 5 and 6.

Participants were introduced to the concept of health data and learned about the importance of these data in tackling AMR. Through online study, participants learned the basic concepts of health data; how AMR data is generated, and how it is transformed into useful information. They discussed and reflected on why health data and AMR data are critical in the work they do and describe how the data that is generated in their facility affects patient treatment. They explored different ways of analysing and presenting AMR data and were encouraged to link their learning to their day-to-day work. The face-to-face workshops allowed opportunity to apply this learning through hands-on activities using real AMR data.

The course was designed so to provide opportunities for participants to monitor their learning, through interactive quizzes, participation in online forums, and activities to reflect on their learning each week. They were encouraged to develop a Learning Journal where they could record how their learning on this course related to their work; a template and guidance for this were included as a downloadable resource. The subject-matter expert who led the development of the event was monitoring participation in the forums over the seven weeks.

The intended learning outcomes of the Data Event were that participants would be able to:

- Explain why surveillance and AMR data are important for tackling AMR;
- Describe the types and properties of health data, and explain how they affect the way they analyse and interpret AMR data;
- Trace the collection and flow of health data and AMR data that they work with;
- Describe the stages from generating and using AMR data to decision-making;
- Identify issues that can affect the quality of AMR data;
- Conduct basic analysis of AMR data using descriptive statistics;
- Choose the most compelling visuals and graphics to enhance data analysis, interpretation and sharing of AMR data.

Activities were designed for different learning experiences. Examples include:

- To work through a case study and engage in activities where they use an AMR data set provided to them.
- To create a data flow diagram and reflect in their learning journal on data quality in their facility. These include encouragement to read additional resources or talk to colleagues about the questions.
- Short activities to pre-test knowledge, with answers available to be revealed.
- Reading of short articles with questions to consider.
- Group work and group presentation during the face-to-face workshops.
- Practical work on Excel using and analysing AMR data from their own facility.

At the end of the Data Event participants were awarded a statement of participation. To be eligible for this, participants needed to have read the online materials each week, participated in the face-to-face workshops, and posted in the forum for weekly, signposted activities. A certificate of participation was awarded to participants who attended the face-to-face workshops.

6. Analysis and Evaluation of the Pilot Learning Events

6.1 Analysis of the Online Course *Understanding Antimicrobial Resistance*

6.1.1 Online Course analytics and participation⁹

Forty-two (n=42) participants took part in the course, nine (n=9, 21%) of whom logged in with a Bhutan government email address, one (n=1, 2%) with an academic and the remaining thirty-two (n=32, 78%) with personal emails accounts. At the time of writing this report none of the participants completed the course sufficiently to be eligible for a certificate of participation. There were 36 views of the learning journal by 18 users of whom 13 (31%) downloaded it.

In terms of weekly participation data is included of completion as logged on the course platform (i.e. all questions needed to be answered for the quizzes and pages to have been clicked through for the course content) and viewing figures¹⁰ (Table 6).

Table 6 Weekly participation data on the Online Course

Logged participation (numbers)	Week 1: A future without antibiotics	Week 2: How do antibiotics work?	Week 3: How do bacteria become resistant?	Week 4: Why are so many bacteria resistant?	Week 5: How has AMR become such a big problem?	Week 6: About AMR surveillance	Week 7: Antibiotic susceptibility testing	Week 8: Bringing the course together
Quiz completion	10	9	7	5	5	4	4	N/A
Quiz viewing	633 views by 22 users	299 views by 15 users	309 views by 13 users	212 views by 10 users	232 views by 10 users	217 views by 9 users	189 views by 8 users	N/A
Course content click through	9	7	8	6	1	4	4	4
Course content viewing	7981 views by 36 users	2967 views by 22 users	1495 views by 19 users	1059 views by 15 users	1488 views by 14 users	314 users by 12 users	229 views by 10 users	54 views by 9 users

⁹ This analysis was compiled on 3rd July 2019 and data reported here was accurate at the point of collecting it in July 2019.

¹⁰ Viewing figures also include 16 OU staff who had access to the Course.

Although Table 6 shows a reduction throughout the course, this is not a pattern of those starting in the course dropping out week on week. Participation in content and quizzes was erratic for most participants, other than 5 who worked through most activities, 2 until week 8, 1 until week 5 and 2 until week 4.

Description and analysis of forum activity

The course forum was viewed 688 times by 28 users. There were 12 discussion threads, 8 directly linked to activities across the weeks.

Table 7 Forum Activity

Discussion threads	Required for the statement of participation	Posts	Summary of participation
Welcome to Understanding Antibiotic Resistance		2 (Tutor only)	None
Introduction Activity 2 - Introduce yourself here	Yes	10 (8 individuals)	All participants introduced their role and commented on the significance of their work.
Week 1 Activity 9 - Opinions on antibiotic resistance	Yes	10 (7 individuals)	All participants rated the urgency of AMR as 10/10.
Week 2 Activity 5 - Finding out about the mechanism of action of an antibiotic	Yes	9 (7 individuals)	All participants posted about a specific antibiotic. One referred to their research with MR whilst on their undergraduate degree and three specifically referred to antibiotics used in their work. Six of the seven could explain the mechanism of action of their identified antibiotic.
Week 3 Activity 2 - comparing intrinsic and acquired resistance		1 (tutor only)	
Week 4 Activity 5 - patterns of resistance		1 (tutor only)	
Half way through		1 (tutor only)	
Week 6 Activity 2 The AMR surveillance process in your workplace	Yes	3 (2 individuals)	Whilst participants were asked to draw a simple sketch of surveillance and upload, these two described as a flow chart within the text of the prose

Week 6 activity 4 - interpreting antibiograms	Yes	2 (1 individual)	This participant generated an antibiogram and uploaded as an attachment, as expected by the activity.
Week 8 activity 9		1 (1 individual)	The participant reflected on the predictions provided in the activity
Course completion		2 (1 individual)	The participant reflected on the value of the course to them and reported what they had completed of the course.

6.1.2 Pre- and post Online Course surveys

In total, twenty-six (n=26) pre-course surveys and eight (n=8) post-course online surveys were completed.

6.1.2.1 Pre- Online Course survey

Individuals' and roles represented

88% of the pre-course survey respondents were male; 12% female. 88% of the participants were from Country 1, while 12% were from Country 3. Ages ranged between 25 and 54 (38% aged 25-34, 58% 35-44 and 4% 45-54). In terms of their highest qualification available, more than 50% of the participants had at least a Bachelor's degree or higher (12% a certificate, 4% a diploma, 54% an undergraduate and 33% a postgraduate degree). Almost all the participants had some experience in their sector; the majority (46%) had 2-8 years' work experience, with the next significant group 29% with 9-14 years' experience. The participants were mostly competent in the use of digital technology, with 58% being highly confident in the use of computers and the Internet. Almost all the participants reported high levels of English language proficiency with respect to reading, writing, speaking, and understanding spoken English. A range of current roles were represented with the largest group (42%) being lab-based and 31% supervisors or heads of units. There were also officers and inspectors and a lecturer included. The units represented were predominantly entitled microbiology, bacteriology or serology.

Organisations represented

All respondents confirmed that they currently worked for an organisation in the public health sector: 35% from the human health, 61% from the agriculture and livestock sectors, while 4% from other sectors. The majority was working in an organisation based in an urban environment (50% in urban; 46% in the capital city). Only 4% identified as being in a rural area. The average number of staff estimated in their settings was 327 with a range of 15-4000 employees. 64% reported that their organisation was part of the country's AMR surveillance network, with a further 17% reporting that this was planned in the future. The majority of the participants extensively use digital technology at work in the form of computers and mobile phones (42%) with more than 70% using them multiple times a week.

Individuals' relationship with the course

Almost half (46%) of the respondents heard about the course from AMR networks in their country, 33% from a colleague, 17% from professional distribution lists and 4% (1) from a noticeboard in their organisation. For most of the participants (80%) the Online Course was their first professional programme on AMR, and almost 60% reported that this was their first experience of taking part in an online course. 73% of the participants agreed to have set specific goals prior to the course. 71% had talked to others at work about taking part. They reported doing so partly to encourage them to join or to share more widely what they would be learning on the course, even if they did not, citing how 'the AMR fight is everyone's business'. The majority of respondents reported being motivated to gain knowledge to which would affect their practice but also to 'appraise the management/policy makers' and see how their work could fit into the bigger surveillance systems.

The course participants anticipated wanting most to gain knowledge about AMR (17%) and to access resources about AMR (17%) followed by knowledge about AMR surveillance (14%), specialist vocabulary related to AMR useful for work (13%) and access to professionals in their country (11%). The respondents on average rated their knowledge of AMR and AMR surveillance at 3.1 at the start of the course but rated their appreciation of the significance of the issue at a global level at 4.2 and local level at 4.0 (on a scale of 1-5). They self-reported the lowest confidence with current use of specialised AMR-related vocabulary.

6.1.2.2 Post- Online Course survey

Individuals' confidence levels on AMR

Figures 2 and 3 show the participants' confidence level on different aspects of AMR before and after the BOC event respectively. It is clear that the confidence level of the participants had significantly increased after the event, with none of the participants reporting low confidence on any of the AMR aspects. The highest impact is on the use of specialised terms and vocabulary related to AMR. None of the participants reported high confidence on this aspect before the course, which after the course increased to 38% of participants reporting high level of confidence. There is a similar jump in the confidence on knowledge and understanding of AMR and the significance of AMR as a global issue.

Due to the low response rates (n=26, n=8) a parametric test to check the significance level of this change could not be carried out. In future events, with higher response rates this limitation could be addressed.

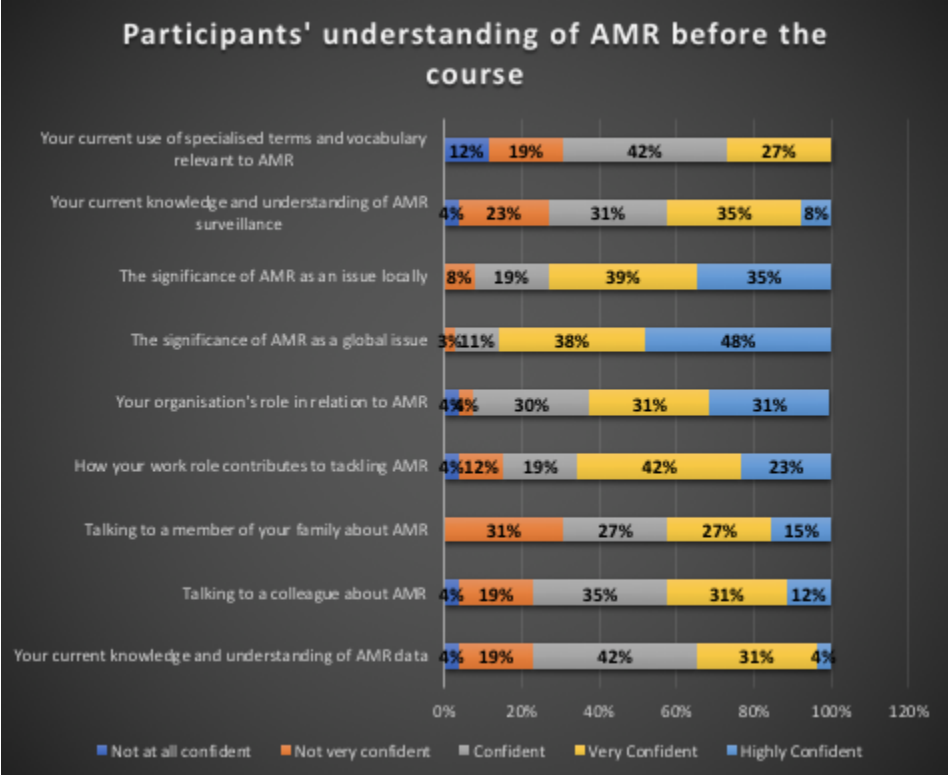


Figure 2 Participants' understanding of AMR before the Online Course

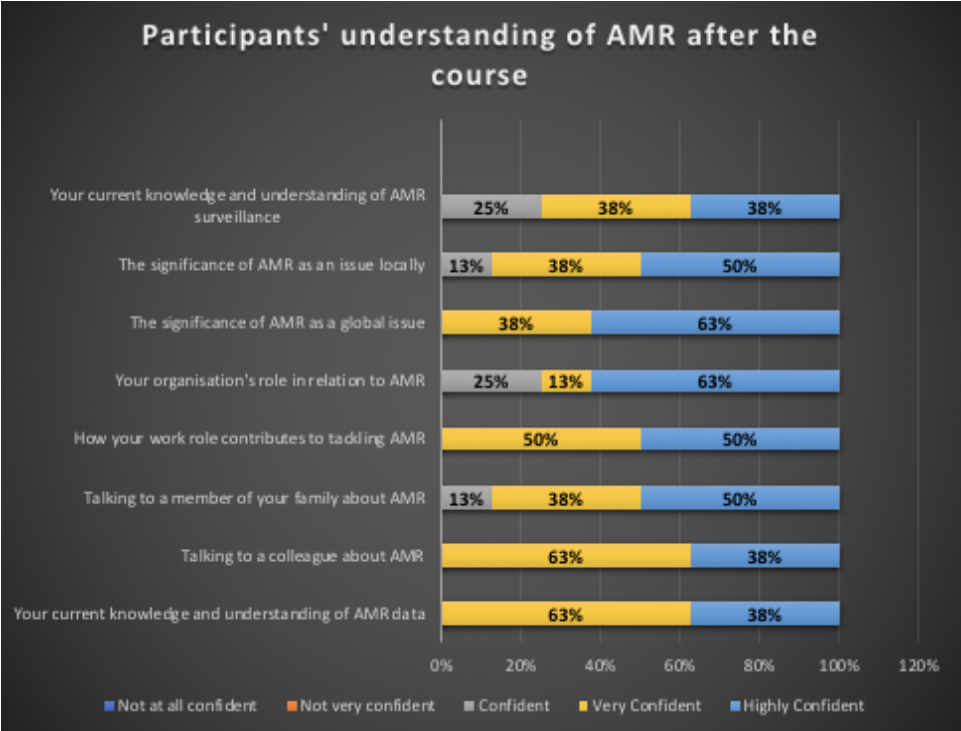


Figure 3 Participants' understanding of AMR after the online course

Individuals' experience in the Online Course

Half (50%) of the respondents in the post-course survey had some experience of online learning for work, while for 37% this was their first experience of taking an online course for work-based learning. Almost all (87%) reported to have spent between 1 – 4 hours for studying on the course. 63% of the participants report studying both at home and at the workplace while 37% studied only at their workplace. A quarter of the participants (25%) used computers, laptops and their mobile phones to access study materials, with the majority chose to work on a PC or a laptop (62%), 13% used mobile phones only and none used tablets. This observation has implications for future iterations of the course, as it will be important to design courses that can be accessed from mobile phones.

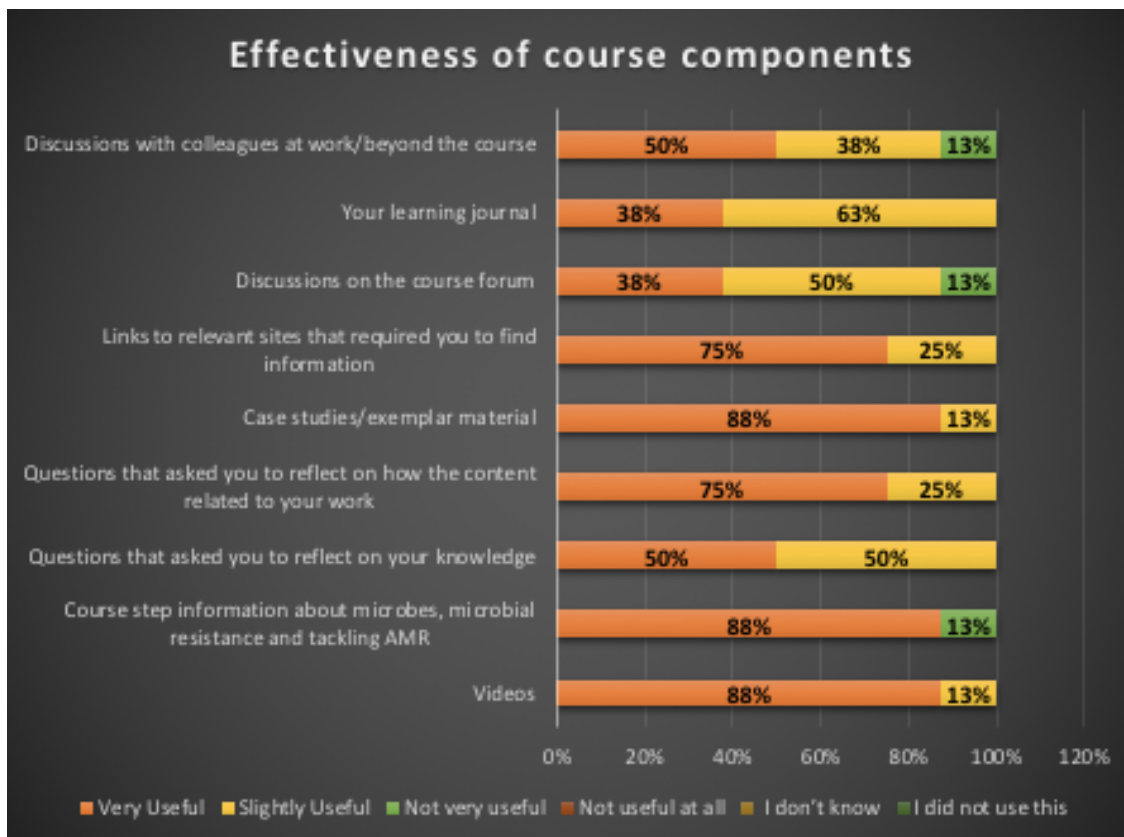


Figure 4 Effectiveness of Online Course components

As illustrated in Figure 4, the participants found most of the course components useful. Almost all (88%) found the case studies and exemplar material very useful, and similarly three quarters (75%) the questions that were prompting them to reflect on how the content related to their work. 13% reported that they did not engage in the discussion forums or in discussions with colleagues at work / beyond the course.

In the post course survey, participants were asked questions related to how they perceive their learning in the course. These questions were modified from the Self-Regulated Learning at Work

Questionnaire (SRLWQ)¹¹, which is a validated instrument that measures how professionals self-regulate their learning in the workplace. These questions elicited data about the following eleven dimensions of Self-Regulated Learning (SRL) - Goal Setting, Strategic Planning, Task/Interest Value, Self-Efficacy, Task Strategies, Elaboration, Critical Thinking, Seeking Help, Interest Enhancement, Self-Evaluation, and Self-Satisfaction. A total SRL score was calculated by aggregating the scores from the above mentioned eleven dimensions of SRL.

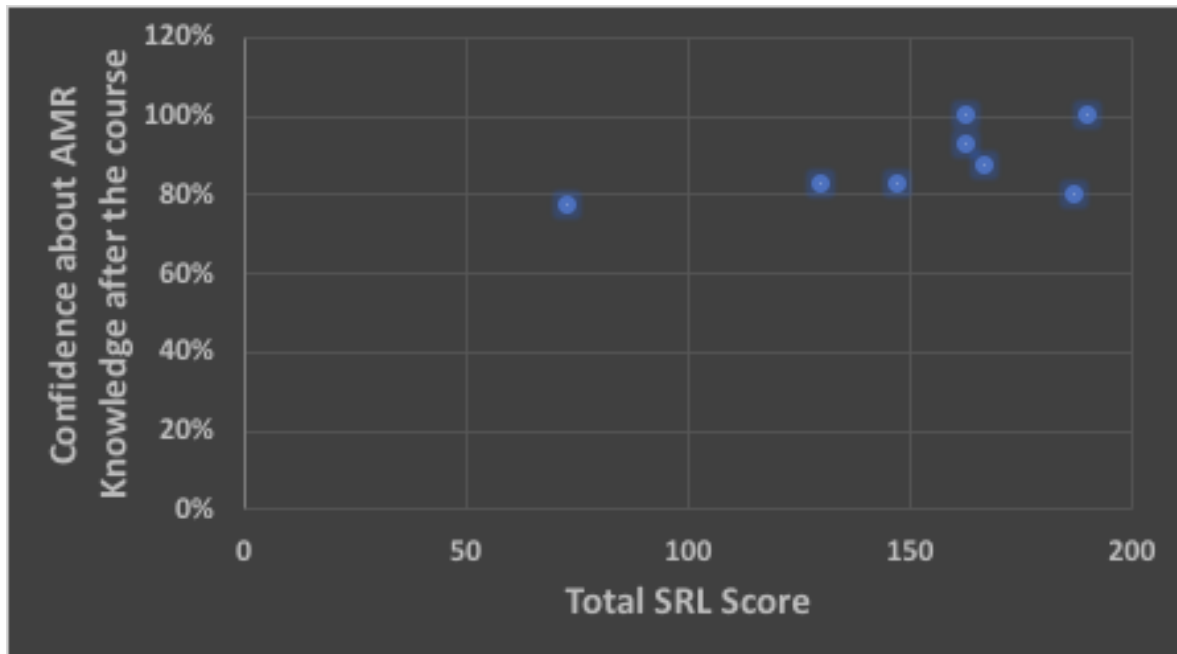


Figure 5 Self-Regulated Learning Strategies employed by professionals while studying on the Online Course

Previous research suggests that learner motivations, goals, and self-regulation strategies shape how they conceptualise the purpose of the online course¹². In order to examine whether there was any relation between the SRL and their learning in the course, total SRL score was plotted against their confidence about AMR knowledge (Figure 5). It is evident that the higher the SRL score, the higher their confidence in course content. A hypothesis test that could confirm the statistical significance of this trend could not be conducted due to the low response rates. However, trend in the data suggests that, in future iterations of the course, it might be useful to design courses that can support the self-regulated learning strategies which can further enhance the professionals' AMR knowledge.

¹¹ Fontana, R. P., Milligan, C., Littlejohn, A., & Margaryan, A. (2015). Measuring self-regulated learning in the workplace. *International Journal of Training and Development*, 19(1), 32-52.

¹² Littlejohn, A., Milligan, C., Fontana, R. P., and Margaryan, A. (2016). Professional Learning Through Everyday Work: How Finance Professionals Self-Regulate Their Learning. *Vocations and Learning: Studies in Vocational and Professional Education*, 9(2), 207–226.

6.1.3 Interviews with participants in the Online Course

Motivation to take part in the Open Online Course

Ten (n=10) interviewees out of twelve did not have any AMR training prior to this Online Course. Two (n=2) had learned about AMR during their degree studies.

The interviewees (n=12) described a range of challenges around AMR in their work, organisation and country. The most frequently expressed concerns were linked to funding, equipment and resources (including human resources), as well as their own skills and knowledge about AMR. Interviewees working within the Animal Health sector also expressed concerns about lack of regulation, the status of AMR surveillance and research in the country, lack of monitoring prescription practices and use of antibiotics, as well as lack of AMR stewardship. Furthermore, within the same group, difficulties around educating farmers and increasing awareness in remote areas were brought up as big challenges.

Interviewees indicated that their opportunities to engage in professional learning were limited and often depended on funding. Not having access to high-quality journals was viewed as an obstacle to learning about AMR.

Many of the professionals interviewed had limited knowledge of AMR. Therefore, the main motivation to attend the course was to increase their knowledge about and understand implications of AMR, as illustrated in the following:

I have been hearing about AMR, and then the consequences of AMR. I read a few papers here and there, and then realised that... I make the contribution to antimicrobial resistance. I didn't have much knowledge on what actually AMR is and how AMR starts, how dangerous it could be if this AMR... is not controlled. And then, I thought if I don't have that knowledge working in my field, I'm not doing—I'm not contributing anything to reduce AMR. So I felt that I should at least have—I should at least know what AMR is. So that's why I participated in this online course. (OC2)

The role of the government in tackling AMR was acknowledged by several interviewees as important. However, interviewees also recognised their individual responsibility to take actions and help raise awareness. In their view, by gaining knowledge, they could contribute to the 'fight' against AMR at the national level. The need to learn about AMR was recognised and one participant had been looking for a similar course earlier but without success.

Some interviewees had prior understanding on AMR. Their motivation to participate in the course was to refresh their knowledge, learn about new trends in this field or gain a more in-depth understanding of AMR.

Several participants talked with colleagues, family and friends about the course they were participating, and this might have helped raise awareness about AMR in their facility, as the following excerpt shows:

I shared with my colleagues [animal health facility], *I'm doing online course on AMR*. So, they were saying, what is AMR? I gave them some examples. (OC9)

After finding out about the course, many of their colleagues expressed their interest to participate and learn about AMR surveillance.

Features of the Online Course

Interviews suggested that offering a course free of charge, the flexibility it offered in terms of when to study, and the ability to access the course even after it was 'officially' completed (after Week 8) were particularly positive features. Indicative of the latter is the fact that three interviewees, who had not completed the course by end of June 2019 (Week 8), reported on completing this in August 2019.

Interviewees claimed to have learnt a lot during the course, independently of completing it or not, and provided some examples to illustrate their gains in knowledge:

I wasn't aware of something like innate resistance that bacteria have. (OC1)

Learning about organisms was the most important. (OC3)

Because now my understanding about AMR and the issues related to AMR, the risks involved if the AMR is not controlled or taken care of, I think that issues, that kind of understanding made me more aware and more mindful about the AMR. (OC5)

The course was described to be user-friendly and not too demanding, especially for participants with a background in science, health or medicine. But at the same time due to its focus on AMR it was perceived as being interesting and important, as suggested in the following quote:

So yes, this was particularly helpful in keeping my interest in (...) to the course because otherwise, when you feel like you don't understand anything or it is out of your understanding, then you lose interest. But I think particularly this course, because I had a basic background, it was relatively easy to understand. But at the same time, it had very important information about AMR that I didn't know. (OC5)

Many interviewees referred to quizzes as a good learning experience, especially because they provided an opportunity to test one's knowledge and learning. This might be related to the fact that the majority of these interviewees must have graduated from an educational system where having tests is the dominant way of assessing one's knowledge.

Regarding the course forum, the majority of the interviewees highlighted that this was a good space to discuss and share understanding around problems and any issues with their learning. However, as shown in Section 6.1.1 the course forum was not widely used by the course participants. One participant felt that Course Forum did not meet his expectations, because the interaction between participants was limited. Also, not having a teacher/tutor similar as in

classroom-based learning events was considered a challenge as it would have made it easier to ask questions and have discussions. That said, one interviewee who had attended several online courses felt that inclusion of forum discussions as well as a learning journal and quizzes were effective, and in his view, other online courses should be designed in a similar way as the OU Online Course.

Similar to the course forums, the learning journal was also not widely used by the participants. Many of the interviewees did not use or could not remember using the Learning Journal. Writing down quiz questions and information from videos and going through them later at home were examples of how the Learning Journal was used. However, in doing this, the participants did not have to log onto the course, and this might have affected completion rates.

Now, whenever I feel like going back, I just go to my journal. I don't log in to [course] anymore. (OC2)

In terms of how the content was offered, animated videos, additional articles and conversations with scientists were seen as good study materials. Interviewees also talked positively about having the option to download materials to pdf documents each of the study weeks. By using this option though, hence choosing to study the materials offline, it is likely that participants were also not fully using any of the interactive activities that were offered in the course.

Finally, the Online Course included many visual materials (e.g. videos) but a challenge that interviewees reported was around downloading the videos. This is linked to issues with internet connectivity that were reported during the interviews. However, video transcripts were available and was positively perceived by the interviewees as it was seen as still supporting access to the video materials. This feature also allowed participants with a preference for textual rather than visual materials, to study in their preferred ways. For example, one interviewee explained that he preferred reading rather than watching videos.

Benefits to the learners

Most interviewees felt that their participation in the course helped them to refresh or increase their knowledge about AMR, and also motivated them to share their knowledge.

Although my office, as I said earlier, we have been doing [INAUDIBLE] antimicrobial sensitivity testing. Then we weren't aware of how things need to be done [...] And for example, if I mentioned a particular thing which I have learned through this course is while doing the AST, I came to know that we also need to have control using standard organism, for example, like endocrine type culture control. These things where in I wasn't aware on this thing, like I need to do these things while doing AST [...] Apart from that, then also the use of AMU, like what antibiotics do we need to use for particular bacteria. So like in our country, we have been using more broad spectrum antibiotics. And also our country, the geographical condition of country is more of terrain and difficulty in communication also. Like transport facilities to the field colleagues, mostly they tend to use long acting antibiotics. So going through this course, it reminded me, although I have learned during my undergraduate programme it was out of my mind [...] that we need to use antibiotics judiciously, discriminately. We need to see what

antibiotics really work on gramme positive bacteria, what antibiotics need to be used for gramme positive bacteria and all. It's a gentle reminder for me. I need to, while attending the clinical cases and also I have my colleagues working in [INAUDIBLE] hospitals, so what [INAUDIBLE] is I need to remind them as well on this important issue. (OC8)

The fact that the Online Course was developed and offered by a Higher Education Institution like the Open University was seen as particularly important, as suggested in the following:

This online course was one of my first online [course] [...], ever since I joined my service. So now after this, I'm now more into taking online course because this user-friendly and then this has got more information that we need, all the information that we need. And then it's, of course, free. Before it was like all the things on googling and then, you know, YouTube, and things which are not formal kind of platform where we can get the information. This online course from the Open University, I think it's more formal. And the information that they have on the thing [AMR] is more trustworthy, I must say, trustworthy or through the scientific researches and all, compared to the Google and the YouTube and things like that, the information sources, other sources. That's the difference, I feel. The credibility is good in this kind of online courses. (OC5)

All interviewees expressed intentions to participate in other online courses in the future.

I think definitely, so given the opportunity and then other options, so I think it is a good learning experience. And in future, too, if there is such type of learning opportunities or online courses related to and might help [INAUDIBLE] so I think I would try to doing the course. (OC6)

Participation in the Online Course increased appreciation of the scale of the challenge of AMR and the importance of the surveillance system, and it also seemed to offer a greater appreciation of the role of the lab in the surveillance system:

Previously, I wasn't having much of an opinion [...] regarding the antimicrobial resistance [...] My opinion changed after your online course - how serious the problem is, the antibiotics, and how urgent the problem is. And what should be done regarding the antimicrobial resistance? And who should be responsible? And I say it's my profession, [INAUDIBLE] how do I fit into [INAUDIBLE] antimicrobial resistance? I specifically learned on how overuse or misuse of antibiotics can contribute to bacteria resistance and why the laboratory capacity should be enhanced or developed at the field level. (OC12)

In a question about what the course enabled them to do differently in their professional role, responses highlighted that they were now feeling confident to discuss issues around AMR, and also contribute to developing strategies including advocacy and raising awareness within own sector, as shown below:

With this the course in particular [...] I can at least contribute in framing some strategy from the animal division side, especially when we talk about the withdrawal trade that our farmers, they are not aware of what we [INAUDIBLE]. So now with this the AMR issues, I think we can advocate and sensitise our farmers. (OC6)

Further to this, their responses suggested that they became more aware of poor practice (their own and also practice of others) and are able to recognise this and also take action, where possible. For example, interviewees referred to changing their treatment approach and minimising the use of antibiotics, following what they had learned:

I told you earlier on that my prescription of antibiotics earlier was quite indiscriminate. I feel that I changed that. (OC2)

Notably, the following interviewee not only referred to being more careful with his own prescribing practice, but also being mindful of colleagues' prescribing practices and occasionally making comments when having concerns:

Oh, yes. Very much. Because now my understanding about AMR and the issues related to AMR, the risks involved if the AMR is not controlled or taken care of, I think that issues, that kind of understanding made me more aware and more mindful about the AMR. And since I am working at the hospital now, I'm more careful about what I prescribe, how I look at the animal patients. Even when my colleagues, they make prescription, they write prescription, I'm always peeking and looking at what they're writing or prescribing. So, I'm very careful about that. And then if I see their prescription a little bit of not very judicious and not very careful, especially when it comes to AMR, I make it a point to tell them about, remind them [...]. And then we have this, even to the field colleagues, whenever I go out for field visits across the country, I make sure that I share my understanding about the AMR to those people. (OC5)

Similar to the interviewee above, another participant referred to an example where he took action following the participation in the Online Course and made a start with the process of putting lab diagnostics in place to identify organisms that cause animal infections:

I mean, the laboratory facilities just couldn't be utilised fully. But we had all the equipment and reagents. So, after going through this programme [OU Online Course], I knew that, now, we need to revive it. So, I used some other leverage technicians from nearby offices near my offices, and then nearby centres. And then we are in the process of putting up at least - differentiate what organism is causing a particular infection in animal. I mean, at least, if we are able to differentiate it broadly, like gramme-positive organism is causing the condition in animals, so we need to give the antibiotic that is specific to gramme-positive one. That practice, we are in the process of putting up in place [OCX)

It is noted that interviews took place soon after the course finished hence some interviewees could not give specific examples of changes they had seen taking place. Instead, they expressed intentions for future actions and pointed to the course triggering ideas of things they

could be doing differently. For example, the next interviewee suggests that because of the course s/he now has a different view of the practices followed around vaccinating drugs with animals:

So I will be more cautious on the use of vaccinating drugs in livestock animal food. I'll be more cautious here. After this course, I have learned that it is a burning issue. So in future, we all will be the victim of it, AMR. So I'll take it seriously, this matter, during my monitoring, regulatory measures in meat related inspection in the farmer's level. I'll monitor how they're administering the drugs and all. So I'll advise them. I'll advocate them. (OC9)

Furthermore, within the Animal Health sector, the need to harmonise animal health certificates, develop test procedures or Standard Operating Procedures (SOP) to guarantee antibiotic free imported meat was brought up. One interviewee mentioned that s/he has been engaged in long discussions with his colleagues and supervisors on this matter with expectations that the authorities will respond to the need.

During the course, I learned what are the antimicrobial resistance pattern(s) in the world globally. As I said, we import livestock and agriculture produce and products from [neighboring country]. So from that point of view, I think we'll have to harmonise our certificates anything that comes from [this country]. As a practice [INAUDIBLE] now, veterinary certificates and animal health certificates are not harmonised. So I think I will have to have my bosses informed about this and then talk about what should be the way forward. (OC12)

The course also triggered some ideas on how to educate others and raise awareness about AMR and improve practice. One suggested path would involve events at schools to educate pupils about AMR and another one to develop an SOP on the drug administration for farmers to support farmers when treating their animals in a purposeful way.

Challenges during studying

Time was identified as the main challenge for taking part in the course. Most of the interviewees reported that they studied both at home and at their work facility – during or outside work hours. Finding time to study was particularly challenging for those professionals whose work was not always in a fixed location (e.g. facility), hence were required to move around (e.g. field officers). A suggestion made was to designate dedicated time for learning online during work hours, similar to provisions made with other training, because it would not require sharing time between working and learning:

Working and learning at the same time is very difficult. (OC7)

Some interviewees further felt that the course was too long and required high levels of commitment to do eight weeks of learning on top of work duties. This might be one reason why many participants did not complete the course, as shown in Section 6.1.1.

Another frequently expressed challenge was poor internet connectivity, which made it difficult for participants to go through, watch or download materials – particularly videos. It was also noted that whilst transcripts for each week were available and participants could download these as pdf documents, video transcripts were missing from these.

Related to poor internet connectivity, two interviewees referred to using their mobile phones and personal mobile data to access the course and another one that s/he used a desk computer to access the course, but lack of sound system made it impossible to watch the videos. One interviewee compared his experience on the OU Online Course with a second online course he was attending in parallel and thought that the OU course was not as mobile phone friendly as the other one. He referred to difficulties he had when opening materials on his mobile phone:

Something was wrong [...] I could not open this [OU online] course. So maybe there was some more images or [...] maybe the file was quite heavy here. Something was there, because [the second] course was very friendly, like, mobile friendly. And I could open anywhere. I could read. I could edit. I could add in the quiz. I could add in the assignment. So maybe you can take that as my feedback. (...) (OC11)

Further to this, some interviewees from the Animal Health sector felt that the content on Human Health Sector was featured more prominently in the course, as illustrated below:

I felt like it was more oriented or targeted at human health than for animal health [INAUDIBLE]. I think if there were more examples, more stories related to animal health, I think it would be more useful for us, instead of learning the examples of diseases that humans are resistant to, and certain antibiotics. Similarly, those kinds of examples were also there for animals [...] So that's what I felt could be useful, especially for people like me. (OC5)

Further to this, specific features or content in the course were not considered relevant to a few participants. For example, Week 6 in the course was related to lab work, but this would not be relevant for people not working in a lab (e.g. field officers). Due to this, one interviewee for example referred to his/her decision to skip this week but what this meant was that s/he could not complete the course and get a certificate. Finally, navigation in the online space and understanding the structure and requirements needed to complete the course was another challenge mentioned by an interviewee.

Suggestions for the future

A number of suggestions were made for future courses that the interviewees would like to take part in. The interviewees suggested courses with a focus on animal health and animal food, but also courses that would allow them to progress towards more advanced levels. Suggestions included:

- Efficient technologies in detection of antibiotic residues in meat products.
- Collection, analysis and use of surveillance data and how to transfer data to be used in the national policies.

- Course around isolates, PCR and technologies.
- Advanced course on clinical practices and clinical veterinary medicine for veterinarians.
- Epidemiology and related statistical and epidemiological tools (how to use, collect and compute data).
- Use of antimicrobials (AMU) and how to monitor this.
- Course related to origin of animal food and AMR.
- On-the-job training in labs to support development of practical skills.
- Advanced courses on AMR how to perform tests, MIC, how to choose panels, what antibiotics can be used in diffusion and which cannot

They further suggested better marketing and promotion of the online courses as some only found out about the OU Online Course through recommendations by colleagues and emails sent out by the OU in-country partner.

6.2 Analysis of the blended event ‘The Power of Data to tackle Antimicrobial Resistance’

6.2.1 DATA Event analytics and participation

Fourteen (n=14) participants enrolled on the course and eight (n=8) participated in the face-to-face events. At the time of writing this report¹³ none of the participants completed the course sufficiently to be eligible for a certificate of participation due to the fact that completion of Week 7 was still pending.

In terms of weekly completion rates from data included on the course platform (completion is logged on the course platform on the basis that all pages needed to have been clicked through for the course content and some activities to be completed): three participants completed all Weeks 1-4; one participant completed Weeks 1-3 and another one did Weeks 1-2; and two completed Week 1 only. The remaining seven participants (50%) did not complete any of the first four online weeks. It is noted that of these, two were among the workshop participants.

There were 29 views of the learning journal by 12 users of whom 7 downloaded it. Table 8 below presents an overview of views of the content throughout Weeks 1-6.¹⁴

Table 8 Weekly Participation in Data Event

¹³ 8 September 2019.

¹⁴ Viewing figures also include OU staff who had access to the Data Course.

Logged participation (numbers)	Introduction & guidance	Week 1: Why is data on AMR important?	Week 2: The basics of data	Week 3: Transforming data into information (part 1): processing and analysing AMR data	Week 4: Transforming data into information (part 2): visually summarising and presenting AMR data	Week 5-6: Weeks 5 and 6: Face-to-face workshops	Week 7: Bringing the course together
Course content viewing	168 views by 21 users	699 views by 22 users	109 views by 21 users	483 views by 17 users	285 views by 16 users	39 views by 9 users	NA

Description and analysis of forum activity

The course forum was viewed 757 times by 19 users. There were 16 discussion threads, 13 directly linked to activities across Weeks 1- 4. Table 9 summarises the activity in the forums. Three participants were regular users of the forums and participated in all the activities that are shown in Table 8.

Most of the threads consisted of individual posts responding to the main tutor question. There was no interaction among participants in the forums and similarly there were no replies back to posts that the tutor posted as a reply to a specific individual (either for feedback or to ask another question). A few of forum activities asked participants to upload a photo (i.e. of their workplace, of the data flow diagram) but no uploads have been recorded. Instead participants opted for a description as text. Photo uploads are relatively easy from a mobile phone, however the participants might have been using the PC at their workplace to study through the online weeks. Some weeks seemed to have incorporated a high number of forum activities (e.g. Week 1, Week 2), whilst there were many compulsory forum activities for receiving the certificate of participation, especially in Weeks 1-2. Further to this, most of the forum activities consisted of three or four sub-questions that required time to respond appropriately and in hindsight these should have been shorter.

Table 9 Forum Activity in the Data Event

Discussion threads	Required for the statement of participation	Posts	Summary of participation
Hello and welcome	No	1 (Tutor only)	None
Introductions	No	7 (3 individuals)	All participants introduced their name and role and commented on what they like about their job. They were prompted to include a photo of their workplace but none uploaded a photo.

Week 1. Activity 1. Pathogens that are antimicrobial resistant	Yes	9 (5 individuals)	Participants shared two of the illnesses/pathogens they recorded and included details about the nature of the antimicrobial resistance (pathogen name, antibiotic it is resistant to, and whether it has exhibited multi-drug resistance)
Week 1. Activity 2: Looking at Healthcare provision	No	7 (5 individuals)	Five participants provided responses around areas in healthcare provision that might be affected by ineffective antibiotics (e.g. patient stay in hospital, cost of care).
Week 1. Activity 3: Pathogens and antimicrobials	Yes	6 (5 individuals)	Participants provided some reasons why there are low rates of laboratory confirmation of bacteria, such as dominance of empirical diagnosis; cost of tests covered by patients; poor equipment in laboratories; limited microbiology laboratories. They also referred to the effects of not confirming the bacteria and not conducting AST, including poor treatment outcomes; prolonged hospital stay and increased treatment cost; patients taking unnecessary medication.
Week 1. Activity 7. Healthcare professionals and AMR	Yes	6 (5 individuals)	Participants reflected on their role as a healthcare professional and why they are important in the response against AMR.
Week 1. Activity 8. AMR surveillance in your facility	Yes	6 (5 individuals)	Participants provided examples where AMR data could be useful in their health facility and their work. Most of the examples were hypothetical.
Week 2. Activity 4: Your variables and indicators	Yes	5 (4)	Participants shared indicators/variables they are using at their facility and also reported on baseline AMR data or targets they may have.
Week 2. Activity 6: Sources of data that you work with	Yes	7 (4 individuals)	Participants picked two indicators/variables from an activity in Week 2 and explained the origin of this data, the nature of this data, and the challenges they have in collecting/working with this data.
Week 2. Activity 8: Creating a data flow diagram for AMR Data	Yes	7 (3 individuals)	Participants were asked to share their data flow diagram from Week 2 Activity 8. None uploaded a photo of a diagram, but three responded with text.
Week 2. Activity 9: Identifying the quality issues in AMR Data flow	No	4 (3)	Participants reviewed responses around the possible types of data errors at each data flow stage in the data diagram they constructed.
Week 2. Activity 10: Identifying quality issues	Yes	7 (3 individuals)	Participants reflected on data quality at their facility and any processes they have in place to ensure that good quality data is generated.
Week 3. Activity 1. Establishing information needs: formulating the right questions.		7 (3 individual)	Participants shared questions of interest for the case study and associated data set that was presented in the course.

Week 3. Activity 2. The journey from data to decision-making	No	4 (3)	Following on Week 3, Activity 2, participants used one of the two questions of interest regarding the case study and associated data set to make a start with the steps of the data to decision-making cycle.
Week 4. Activity 7. Completing the data to decision making cycle - data analysis and presentation	No	6 (3)	Following on Week 3, Activity 2, participants used one of the two questions of interest regarding the case study and associated data set to complete all the steps of the data to decision-making cycle.
Hello and introductions to Week 5 and 6 learning	No	1 (tutor only)	None

6.2.2 Pre- and post-course surveys (Data Event)

In total, eleven (n=11) pre-course surveys and eight (n=8) post-course surveys were collected from the Data Event participants.

6.2.2.1 Pre- data course survey

Individuals' and roles represented

64% of the pre-course survey respondents were male; 36% female. All participants were from Country 3. Ages ranged between 25 and 64 (18% aged 25-34, 63% 35-44 and 9% 45-54 and 9% 55-64). In terms of their highest qualification available, almost half the participants had at least an MPhil or a PhD (37% MPhil, 9% PhD, 9% Masters, 18% undergraduate degree, 18% Diploma). Almost all the participants had some experience in their sector; the majority (50%) had 2-8 years' work experience, with the next significant groups both at 20% with 2-8 and 15-24 years' experience. The participants were mostly competent in the use of digital technology, with 55% being highly confident in the use of computers and the Internet. Almost all the participants reported high levels of English language proficiency with respect to reading, writing, speaking, and understanding spoken English. A range of current roles were represented with the largest group (55%) being lab-based (lab technician, lab scientist, lab manager). 9% were clinicians, 9% supervisors and 18% were microbiologists.

Organisations represented

All respondents confirmed that they were working for an organisation in the public health sector, in a human health facility. They were all working in an organisation based in an urban environment (64% capital city, 36% urban). The majority of the participants extensively used digital technology at work in the form of computers and mobile phones, with more than 50% using them multiple times a week.

Individuals' relationship with the course

For most of the participants (81%) the Data Event was their first professional programme on AMR, and almost all (90%) reported that this was their first experience of taking part in an online course. 82% of the participants agreed to have set specific goals prior to the course. In statements about

which course components they anticipated would be useful for them, the majority responded positively to all items on the list (Figure 6), with high responses in items related to knowledge development, knowledge of data analysis and access to resources about analysing data (81%).

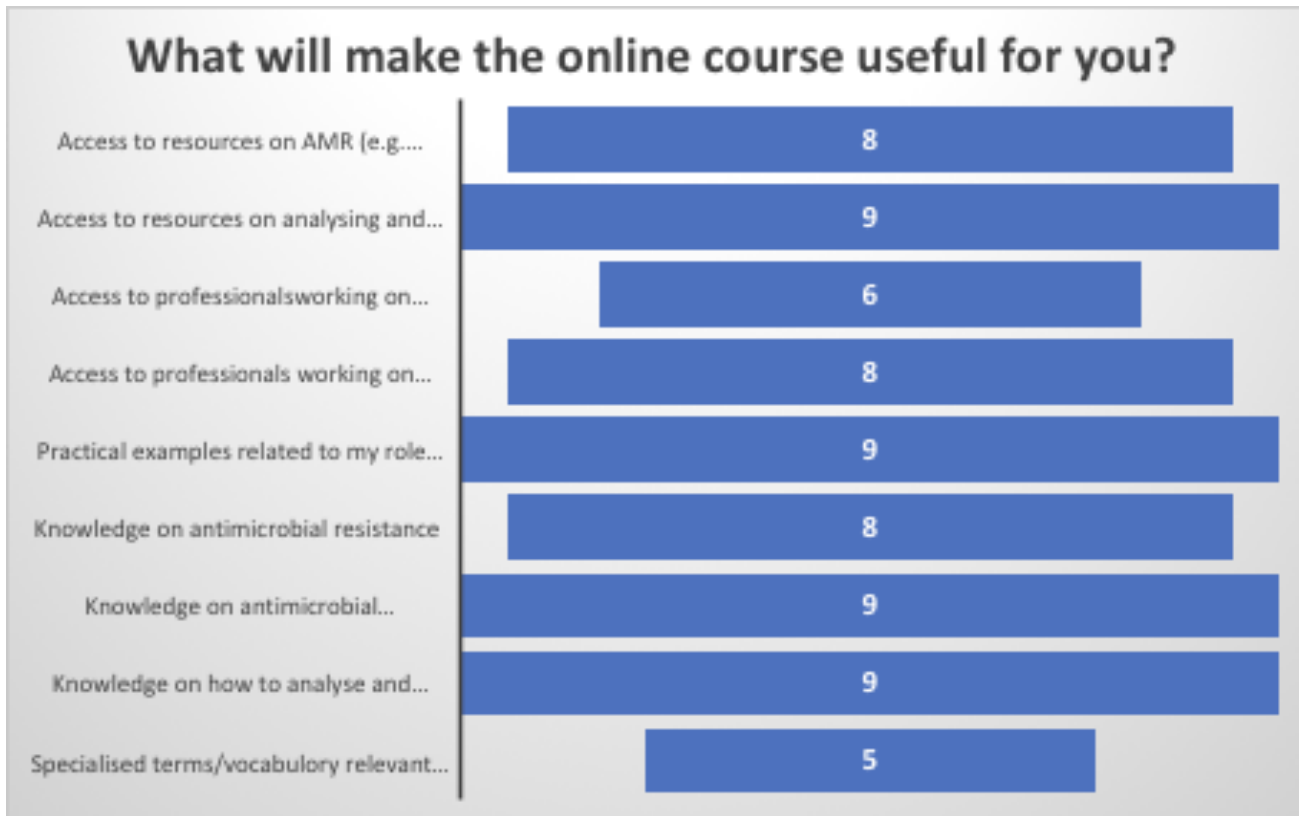


Figure 6 Usefulness of course components prior to the Data Event

Participants' understanding of AMR before the course

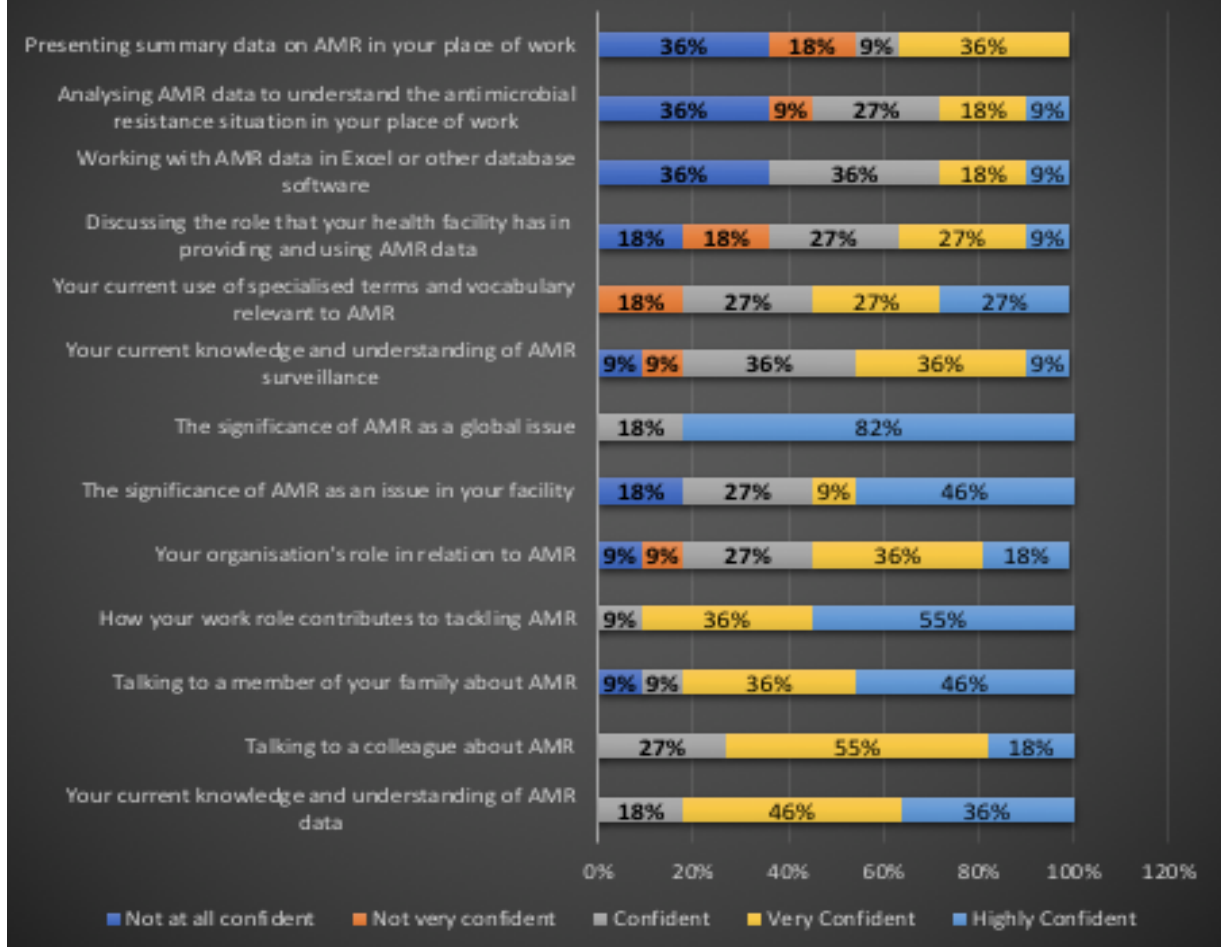


Figure 7 Participants' understanding of AMR/AMR surveillance before the Data Event

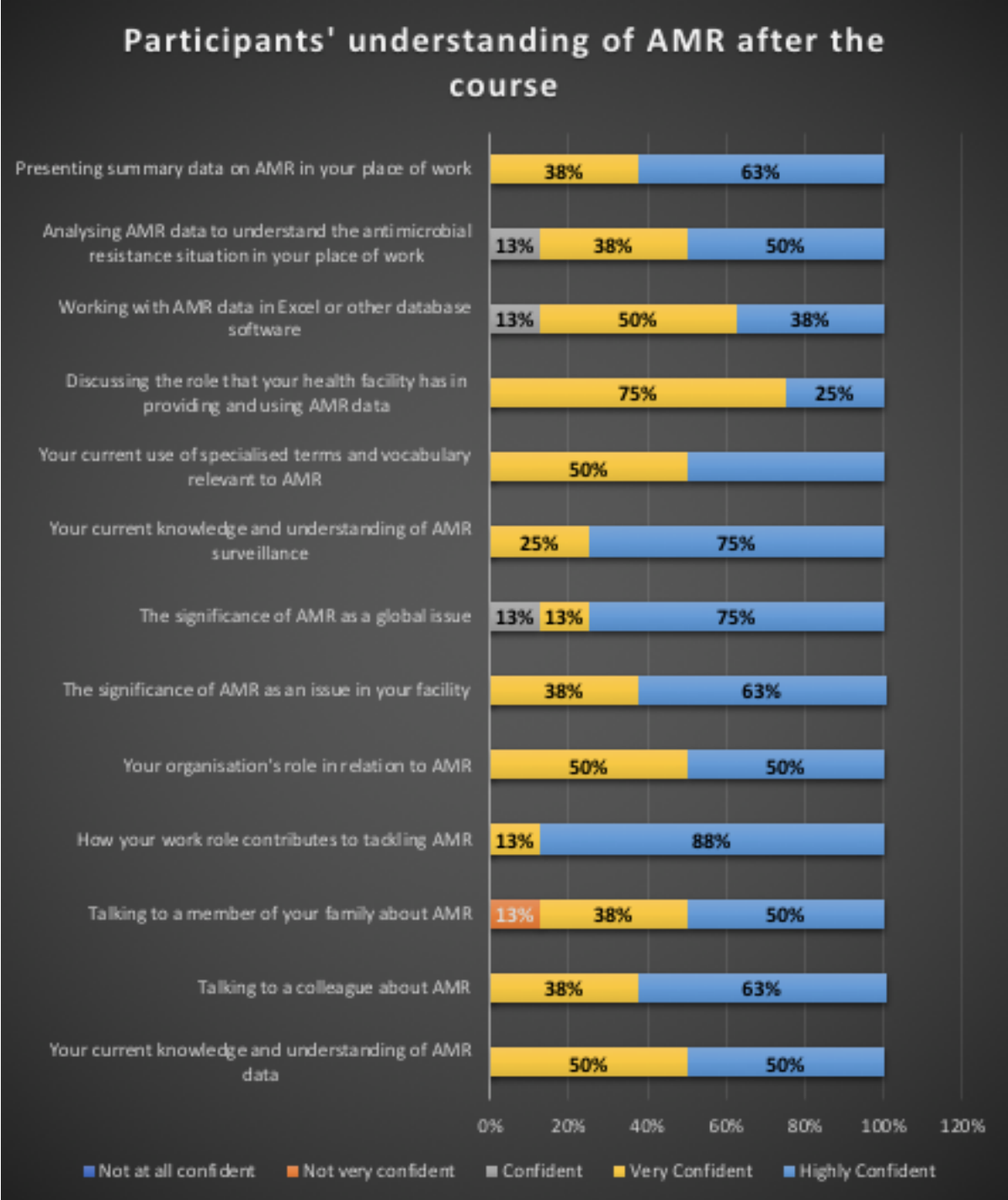


Figure 8 Participants' understanding of AMR/AMR surveillance after the Data Event

6.2.2.2 Post- data course survey

Individuals' confidence levels on AMR

Figures 7 and 8 show the participants' confidence level on different aspects of AMR/AMR surveillance before and after the Data Event respectively. The figures demonstrate that there was an increase in confidence level in almost all the aspects related to AMR data after the Data Event, with none of the participants reporting 'not at all confident' on any of the AMR aspects. The highest impact was on presenting summary data on AMR, where before the Data Event 36% of the participants reported that they were not at all confident on this aspect and none of them reported being highly confident. However, after the course 63% of the participants indicated that they were highly confident about presenting the summary data on AMR at their workplace. Similar impact can be seen in the items referring to analysing AMR data, and working with AMR data in Excel or other database softwares, which have been the focus of the Data Event. 13% of the participants still indicated that they were not very confident about talking to a member of their family about AMR after the event. Due to the low response rates a parametric test to check the significance level of this change could not be carried out. In future events, with higher response rates this limitation could be addressed.

Individuals' experience in the Data Event

None of the participants had any experience of undertaking an online course for work-based learning prior to this course. 37% and 50% of the participants reported to have spent between 1-2 or 3 – 4 hours studying on the course respectively. 25% of the participants reported studying both at home and at the workplace, with 37% studying only at their workplace and 25% only at home and one participant (13%) indicated that s/he had to go to the library for their studies. Interview data shows that Internet connection was the most cited issue the participants referred to. All of the participants used either computers/ laptops (75%) or their mobile phones (12%) or a combination of these devices (13%) to access study materials with none using tablets.

In terms of the effectiveness of various course components, as shown in Figure 9, the majority of the course components were found useful by the participants. Everyone (100%) found the group work during the face-to-face workshops and the use of real data useful. 13% reported that they had not engaged in the discussion forums, used the learning journal or engaged in any discussions with colleagues at work or beyond.

In the post course survey, participants were asked questions related to their learning on the course. These questions were modified from the Self-Regulated Learning at Work Questionnaire (SRLWQ) (Fontana et al. 2015¹⁵) which is a validated instrument that measures how professionals self-regulate their learning in the workplace. These questions elicited data about the following eleven dimensions of Self-Regulated Learning (SRL) - Goal Setting, Strategic Planning,

¹⁵ Fontana, R. P., Milligan, C., Littlejohn, A., & Margaryan, A. (2015). Measuring self-regulated learning in the workplace. *International Journal of Training and Development*, 19(1), 32-52.

Task/Interest Value, Self-Efficacy, Task Strategies, Elaboration, Critical Thinking, Seeking Help, Interest Enhancement, Self-Evaluation, and Self-Satisfaction. A total SRL score was calculated by aggregating the scores from the above mentioned eleven dimensions of SRL.

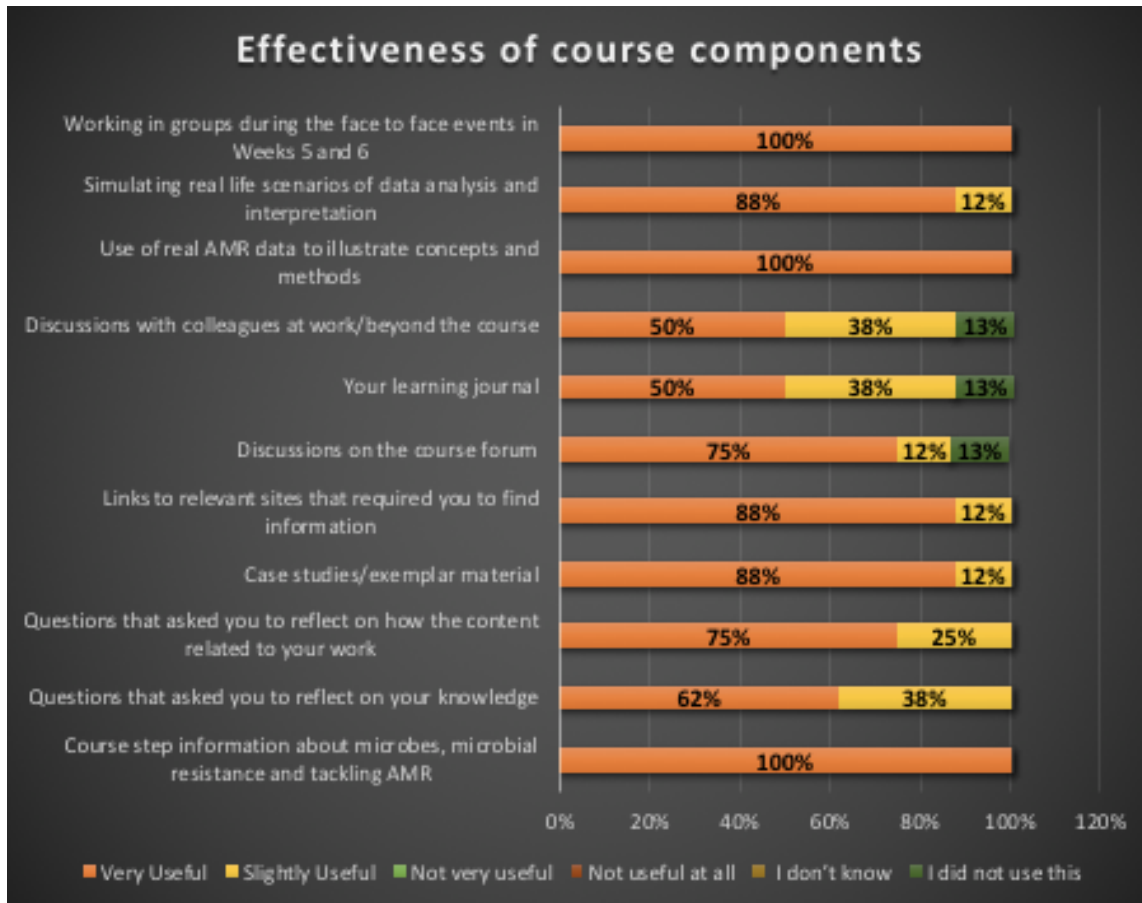


Figure 9 Perceived effectiveness of Data Event components

Research suggests that learner motivations, goals, and self-regulation strategies shape how they conceptualise the purpose of the online course (Littlejohn et al. 2016¹⁶). In order to examine whether there was any relation between the SRL and their learning in the course, total SRL score was plotted against their confidence about AMR knowledge (Figure 10). It is evident that the higher the SRL score, the higher their confidence in course content. A hypothesis test that could confirm the statistical significance of this trend could not be conducted due to the low response rates. However, trend in the data suggests that, in future iterations of the course it might be useful to design courses that can support the self-regulated learning strategies which can further enhance the professionals' AMR knowledge.

¹⁶ Littlejohn, A., Milligan, C., Fontana, R. P., and Margaryan, A. (2016). Professional Learning Through Everyday Work: How Finance Professionals Self-Regulate Their Learning. *Vocations and Learning: Studies in Vocational and Professional Education*, 9(2) pp. 207–226.

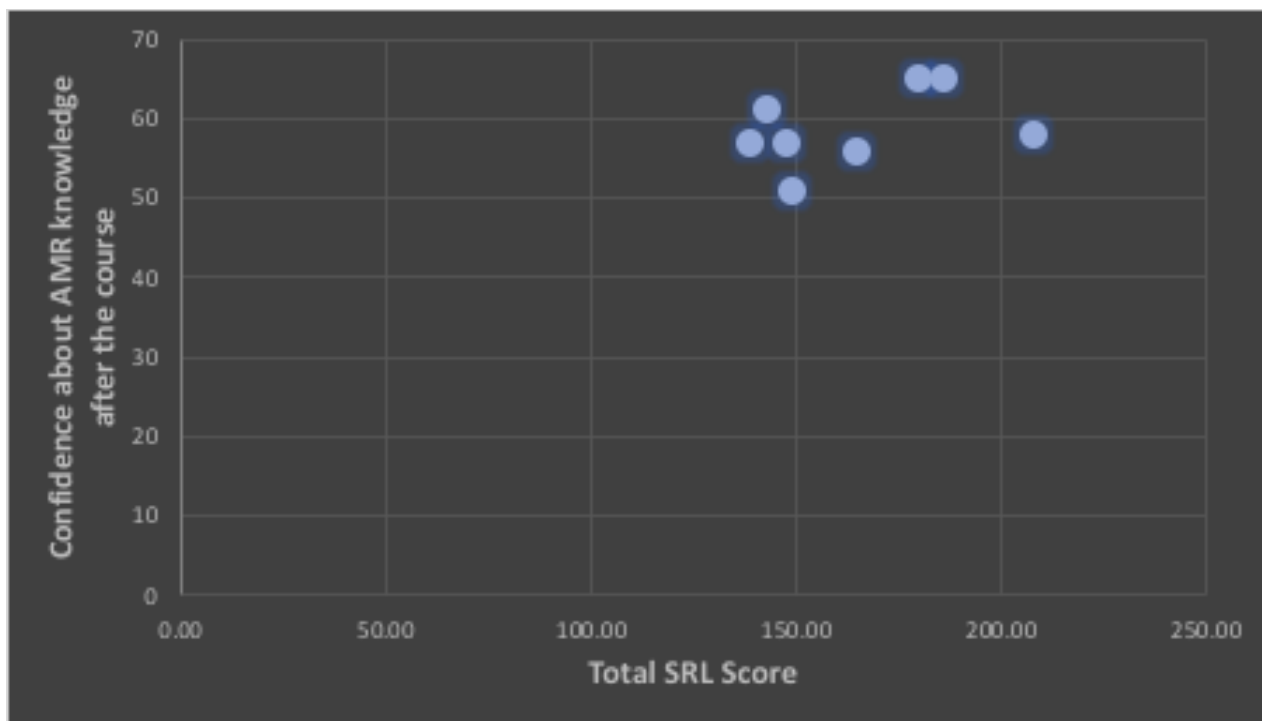


Figure 10 Self-Regulated Learning Strategies employed by professionals while studying on the Data Event

6.2.3 Interviews with DATA Event participants

Motivation to take part in the Data Event

For almost all the interviewees (n=7) this was their first experience of enrolling on an online course. For a few, this was the first time they had taken part in any programme on AMR, also evidenced in the surveys. This verifies one of the key findings of the scoping phase, that there are limited opportunities for training and building capacity on AMR.

The interviewees referred to their main motivation for enrolling in the Data Event, which was seen as advancement of knowledge and addressing some practical issues they were experiencing in their everyday work practice, such as analysing and presenting the data. This is evidence in the quote by a Lab professional below:

I have passion for antibiotic resistance, because it's like, in the time when I started working here, some drugs that were sensitive are becoming resistant now. So sometimes I keep asking myself, is that where we are going to? And then what really broke my heart was [names an antibiotic] used to be our last resort. Now, some patients have become resistant to that one, too. So when I heard the talks about antibiotic [surveillance], I want to know more, especially about the data presentation aspect, the data processing and data analysis" [P12, Lab professional]

As shown in the analytics above, engagement with the course varied, with many participants saying that they did everything that was included in all the weeks and others admitting that they did very little. They often expressed an intention that they would still continue their studies on the course. They all referred to having informal discussions with colleagues about their learning on the course, whilst sharing of learning did not happen through any 'official' mechanism.

Features of the course - design and structure

One participant praised the flexibility that the Date Event offered to them:

This particular course was [flexible], because it's like if you have more time in one week, you can try and finish, because I tried to did [do]everything in one week. So it's flexible. I like that aspect that it's flexible. Also, when you have time, you go and check and all that" [P12]

This is an important feature to highlight, especially when almost everyone referred to 'time' as a key factor limiting their engagement:

What happened is, especially at the online, because we are working, you won't get enough time to do it online. Unless maybe you have a break, or you go home after work... or weekends-Saturday, Sundays. Only you have a little time, then you do it. But when you are working, you can't get time to go online and do all those things. Because as the manager, your office [staff]— comes in with a problem to solve. So you have to see to it before you can go online and do your work [P11]

It is noted that due to tight schedule in the implementation of this event, the face-to-face workshops took place directly after Week 4. This meant that participants had no time to catch-up with online content, if for any reason they could not complete any of the online weeks prior to the workshops.

The face-to-face workshops were the highlight for most of them and they all referred to them as being a good complementary of the online weeks. The workshops helped them address some of the challenges they faced with the content online, as well as put in practice the theoretical concepts they had been learning in Weeks 1-4. The course team anticipated that concepts such as data processing would have been challenging and needed to have a strong presence in the face-to-face, which is well aligned with what the participants reported.

Now, with face to face, I think it gave us a better understanding [...] Because you need to do the thing in the data, work on it. And then as you do more work on it, then you improve your skills. And so I think that part of it... it opened up my eyes [...] [P8]

For learners that had no or limited experience of online learning in the past studying online had its challenges. This might be because most of their experiences of learning on-the-job that they could recall were in the form of going out of the office for 'training'. One mentioned that online is more difficult because you need to

dig and find answers on your own. And you have a forum where you can go and then discuss with your colleagues. But you have to go and dig down to find some of the solutions to the questions that are being asked. [INAUDIBLE] face-to-face, you will get the solution on the go. But this one, you have to go and where you are finding it difficult... you have to go dig down, search the answers, and then come and solve it [P11, senior lab]

The same participant said that a way to address some of the challenges she faced in the online weeks was to have a 'buddy', namely a colleague she could talk to regularly for advice and some explanations.

Further to this some minor issues were reported in terms of logging-on, navigating around the platform and familiarising with the interface.

Features of the course - Forums and Learning Journals

Views about the use of forums were divided. Overall the use of forums has been limited and only three participants participated in every activity. The interviews did not provide strong evidence why participants did not engage with the forums, but a reason could be that there was partly duplication between work included in the Learning Journal and the forums. So, similar to the participant quoted below, some participants might have opted to engage with only one of the two media and not repeating responses online. Another reason could be that the Learning Journal could be downloaded and used offline. It was a private document, whereas the forums were 'public', and as the quote below illustrates, some participants might have felt nervous about posting online. This is a common finding in online learning and might also be related to the participant's lack of experience in online learning activities prior to this course.

The forums, is sometimes you write it. And then going back online, it takes time. So maybe you were online, I didn't put my information the [forum] when I was doing it first. And so maybe it will not be a good [comment]. But at least I put the [response in] the journal so that will help me" [P8, senior lab professional]

One interviewee said that whilst he did not use the forums, he read other people's comments "to get the facts, some of the facts that I am not familiar with, then use it to answer the questions online"[P11]. Another reason for lack of engagement might have been the roles of the participants, namely senior lab professionals and lab professionals who knew each other as they were colleagues. One of the senior lab professionals who did not engage in the forums mentioned in the interview that he is not knowledgeable or experienced about AMR, so this person might have been reluctant to appear among colleagues that he has no expertise in this field.

Similar to the forums, views about the use of the Learning Journal were divided. A few participants reported that they used it and found it highly useful - as pointed in the quote below - whilst others only downloaded it but made no use of this.

The learning journal is very good. Very good in the sense that it helps you to keep track of your answers. If you write anything down also refer to it at any point in time. So for me, I thought it was very good. But what I saw with the learning journal was that it's not easy to copy from-- not easy to copy per se, but to do-- I didn't know how it was formulated, but it took me a lot of time" (P13)

Benefits to the learners

The interviews included questions that would elicit responses to indicate benefits from taking part in the Data Event (see Annex 3). It is noted though that the interviews took place only a few days after the face-to-face workshops so many of the benefits reported below are in the form of reflection, acknowledgement, intention or aspiration.

Participation in the Data Event supported gains in knowledge about AMR and the AMR surveillance system, and enabled participants to learn about tools, techniques and practices appropriate for the participants' role.

All participants referred to the use of an Excel 'Pivot' table as one of the things they learnt. This points to the participants having a benefit in terms of a specific tool to use in the analysis of data. A few expressed motivation to carry on studying some of the things that were covered in the course (e.g. Pivot table). Even work on Excel itself was seen as beneficial, alongside aspects such as presentation and communication:

P13: We were taught how to use the Excel to do data analysis. It has really-- I never knew about how to use Excel to do analysis. Normally I would do it manually, input into the-- and input into certain part of the Excel and I [wouldn't do the graph] in the Excel. But now I can enter data into the Excel and do the analysis on the Excel without do it manually, before coming to enter and do the graph. And I really liked that part where we're taught how to do a simple presentation. Within some short minutes, with some few slides. Yes. And I really like that aspect.

INTERVIEWER: Would you say this is an important change for you? And if so, why?

P13: It's an important change for me, because while I've been doing some analysis, and presenting at clinical committees in the hospital. But I use the conventional methods and sometimes it takes time for me to fill in the whole thing. And it takes time for me to present-- we are given some minutes to do the presentation. Normally we were able to meet that target, so going to the face to face, the analysis and how to do presentation, that has really helped me a lot. It's going to enhance my way of reporting the [AMR] situation in the lab to the hospital [P13, senior lab]

Some of the participants had very little exposure to the process of analysing data prior to this course and reported that in their role they are relying on other colleagues to perform this part of the job. Their participation was beneficial as it allowed them to develop an understanding of the nature and the importance of this task, but also to realise some possibilities within their role that they could be taking forward:

This is my first time using it [processing and analysing of data]. [INAUDIBLE] (Colleagues are in) control, are the ones in charge, they are the ones who analyse our data for us. But with this, I've got an insight that I can also do it. So after the face-to-face, I was able to 'see' the data. So I'm not static, and I hope things will be work. So after they are analysing and getting the message along, you can take (action) and come up with a better choice to improve our work" [P11, senior lab]

Participation in the Data Event increased awareness of poor practice associated with AMR surveillance. It also led the participants to appreciate better the role of the lab in the surveillance system.

After their participation in the course, interviewees across both facilities seemed to have established some clarity around issues they face with missing or incomplete data. They could for example trace the origin of this issue back to clinicians' practice and the request forms that are receiving from them, as evidenced in the quote below:

On the clinician side. It's an issue, because they fill and leave part of the information, and therefore it becomes very difficult for us to synchronise whatever we have [INAUDIBLE] [...] we don't have all the details. So like, during their presentation [2nd day of the face-to-face workshop] we realise that we have some details missing from the [INAUDIBLE] data [...] Sometimes it could be the age. Sometimes it could be the ward. The ward, especially, because, you know, if I have isolates, or I have resource for resistance or something, and I want to target a ward, it's radical for me to prevent this in the ward that I'm going to" [P8, senior lab]

One of the challenges, we are trying to move to the (electronic system). But we still have request forms that are handwritten. And we don't want ones you don't have all the information you need on it. So when you're going to our register or our books, you see some missing data. So that is one of the main challenge we have now. We can have request form without A8. Without AGF, it's one of the [INAUDIBLE]. And we know with the local names, you can have a name that can go for both male and female [...]. So when they don't state their sex, it's difficult to know that it's for a male or a female. And it's sometimes the clinical data or the diagnosis is not the [INAUDIBLE]. They don't really write that. It's just about 10%. Most of the forms come without diagnosis. So it's also a challenge here [P12]

In the following quote, the senior lab professional from Site 2 raises a similar issue, but he also refers to his intentions to take action about this:

P11: I think we've now realised that some of our data are handicapped. There are so many gulfs, missing items.

INTERVIEWER: Would this be based on the request forms, for example?

P11: Yes, especially the ages in particular, and also the source. Some of the source are missing.

So now, we are planning that every sample that come with requisitions. And those that are request to on nets. We have electronic requests. All those details, that is needed must be collate before even we take off in processing that sample.

INTERVIEWER: Are you going to have mandatory fields where it doesn't allow you to press Request, if you haven't filled it in?

P11: Yes. We are consulting with IT. They are in charge. Even initially, we were having a problem with the source. We have wards around. But samples are brought in without where the sample is coming from, any of the wards, like the female ward, kids ward etc.

There was also strong evidence that participants became more aware of the importance of communicating relevant findings from the analysis of the data with other stakeholders in the facility, indicating that their current practice might not be as appropriate:

So my view has changed in terms of that. It's not about just bringing out and bringing out, presenting, like coming out with the information. But it should be relevant information. But she [facilitator] asked, 'what is the important? So if you find out this, so what? And how do this affects the way of how you're going to affects these issues?' So some information may come up, but it may not be relevant. [P7]

So we need to improve in that [missing data]. We are hoping that with this training, we can begin presentations. And then we already know what is going on, and how to advise the patient in order to know or tell the doctors how to do the empirical treatment for patients. It's one thing that is missing. I'm hoping that with this training, we can improve on that data presentation [P12]

Participation in the Data Event increased appreciation of the scale of the challenge of AMR and the importance of the surveillance system.

It was evident from the interviews that after taking part in the Data Event participants reached a greater awareness about the importance of surveillance data. This is important and the happening of this 'moment' may open new ways forward into the future. Such a realisation, however, may or may not lead to a change in practice, especially when barriers in the environment are still in place:

We see data differently. We were doing our data things manually. And if all of the variables are put up properly, then working on our data would be faster. And then we can make meaning out of it easier. But for now, we capture them manually [P8]

Their participation also seemed to reinforce the view for a stronger surveillance system in their facility, especially around identifying trends at the facility level as evidenced by the lab scientist below:

Most of the doctors I know will start treatment whilst waiting for the laboratory results. So the change we can put in is to try and get a pool, like a database of drugs that can help [the doctors] before the lab results comes out, because now she's [doctor] treating. She doesn't know what is best. She's just treating. And she's treating uninformed. But if the lab generates like maybe one-year data, OK, for infections like this sepsis. If you are suspecting gramme negatives, you can simply start with this. And the lab will come off with that. [The interviewee refers to an example of a fatal incidence with a baby] She [doctor] was treating with Augmentin, which is a- all the Augmentins recorded didn't work. They were mostly resistant. And she was giving the baby Augmentin. It doesn't work [P7]

In the same quote, the interviewee highlights a greater understanding of the interdependency of roles within a surveillance system. Related to this, another important benefit is that participants seem to have realised that generating good quality surveillance data is a shared responsibility among professionals working across distributed teams. In other words, participation in the Data Event led to increased awareness that good surveillance relies on well-functioning networks:

P11: We are now planning to extend our knowledge to our colleagues, for them to know the benefit of AMR. Because we lack so many things in this.

INTERVIEWER: OK. Fantastic. And would it just be your colleagues in the lab? Or [...] are you thinking of spreading it to the clinicians, the nurses, the pharmacists?

P11: Yes. The data is not for us alone. After the course, I've known that it starts from the local to the district or region, then national. And then goes globally. So it's something that is a teamwork. So all my colleagues in the lab has to know about this. The clinicians as well must know. The pharmacists, the nurses, and those in charge of health must all know about this [P11, senior lab]

And then another thing that came to mind that helped was initially I wasn't concerned the data quality wasn't so much an issue to me. And I was like, I'm going to do my weekly [tests] and give my results and all that. But now I'm conscious about the quality of data. So like you're looking to go down [reception / sampling area]. They [phlebotomists / nurses] have to talk to their patient to ensure that they give a quality specimen and then for us to get quality data. So now quality is something that I'm conscious about [P12]

We are now looking at data quality. So sometimes, initially, if an information is missing, I wouldn't go to the [electronic] system to find out. So now, like we are being conscious. We can go back to when you checked a little detail about the patient. We are trying - we are hoping. We want to get everything right, so I can do a good presentation [to doctors] for the second half of the year. We want to do something good. [P12]

Related to this, in a question to recall an example where they are doing things differently because of participating on the course, a lab scientist recalled an example with a sick kid in the ward the day of the interview and she described that she went to the ward and

emphatically left and I said, we need fully filled forms, because realised that missing data can make your - (can-- puts a-- administer the output of your) whatever you can come out if you don't have fully filled or if you have missing data. So I enforced that we should put on the ward, the diagnosis, and all this news to help. So maybe that's something new (P7)

Participation in the Data Event triggered a shift in perceptions of open, online and distance education and acceptability of ODL as quality education. It also led to better appreciation of the role of the lab in the surveillance system.

It was beneficial to have senior and junior staff involved in the Data Event and the face-to-face workshops, as especially one senior professional appeared to be considering the need to have dedicated people in specific AMR roles alongside broader changes in workplace structures:

AMR training has opened my eyes, because we don't have a team for such a venture. We do things, and then we keep all those things which are necessary for it to be utilised. So I will be happy if a team or a committee is formed is for involving the lab, the clinicians, the nurses, the pharmacy, and those who are also needed as far as the improvement of the work is concerned [P11]

Also, some indications of change were noticed in participants' descriptions especially around 'valuing' online learning and accepting this as good quality education:

Actually, that was my first time engaging in an online course. So I found out, oh, this one is interesting. So, yes, so initially, when I heard about online course, I think it's something abstract or something I couldn't do. But after taking part in this, I realised, oh, it's not that difficult. So now if I get other online courses...I'll do it. I will gladly do it. [P12]

I would like to have such online courses, because it really helps you to learn the new things that are coming up in relation to our profession, our work. Especially I'm-- OK, this is offline, but as I was saying, in the morning there's a course, another course in the Open University apart from The Power of Data course. So which I'm also interested in, to enrol in it. So I'm trying to see what new things are out there for me to learn. [P13]

One interviewee seemed to have realised how important the lab is within the system - "so I think now a lot relies on the lab to come out with a trend" [P7]. It is very important for staff to feel they are in a workplace that contributes to a critical area of AMR surveillance, especially considering that the lab is 'cinderela' of the medical services (Wilson et al., 2018)¹⁷.

¹⁷ Wilson, M.L. et al., 2018. Access to pathology and laboratory medicine services: a crucial gap. *The Lancet*, 391(10133), pp.1927–1938.

That kind of relation is untapped, between the conditions in the lab, or the main area of the hospital and the lab. So, I believe this online course is going to help us interact more with the conditions and make them understand the reason why they have to get this report. And it's also going to help us to be also on our toes to also do the right thing, and making noise about what is happening in the lab with concern to AMR surveillance [P]

Participation in the Data Event triggered plans to take action to address poor practice, involving engaging in inter- and intra-professional communication.

A few interviewees referred to their future plans such as looking for more opportunities for learning online and enrolling on more courses on AMR. One participant already enrolled on another OU course, whilst another one mentioned the OU Fleming BOC expressing his intention to study on this one as well.

The Head of the unit on Site 2, despite admitting that they have not yet started implementing what they learned, he referred to meetings that will be scheduled with:

Our units, where we sit down and-- because, for example, some of the antibodies we've got to stop testing, which we learned. Most of the resistant antibodies, we have to stop testing. It's a waste of resources. So, I'm going to schedule a meeting with our unit, and then sit down and then take a concrete step as to how to implement everything we have learned. So, after that meeting, some changes will start coming. And also I'm trying to create a database whereby you enter all our AMR data inside, to do monthly and quarterly reporting [P13]

In this quote is also evident a point raised in earlier section about being more aware of poor practice they perform, which as he says is a 'waste of resources'.

A few participants expressed motivation to carry on studying some of the things that were covered in the course (e.g. Pivot table). One participant refers to applying for funding for operational research to study what doctors do with data over four months.

Suggestions for the future

A number of suggestions were made during the interviews with the participants in the Data Event. Some are associated with challenges they faced during their study on the Data Event. Suggestions included to invest more time on the face-to-face session as it was thought to be "too short" [P11] and that "the days that were assigned to the whole face to face programme were very small" [P13]. Other participants suggested to provide opportunities for cross-lab visits as part of their learning, but also more opportunities to interact with clinicians. It is noted that only one clinician signed-up for the Data Event, even though it was the OU's intention to engage with more clinicians in the Data Event. Issues with technology were raised and suggestions included to consider how to address challenges with access to equipment at work. The main challenge, almost raised by all interviewees was related to issues around time and the difficulty

of fitting study around work or other commitments – which proved harder than expected for many:

And then some of the weeks, too, were packed. The stuff in there were packed. Especially the week two and week three. Yes. The contents were a lot. So, we had to spend more time, because [it is] more hard [when] you are working. You are working in it at the same time. And I like [it to be] a bit challenging. So, the contents were packed in week two. And three and four also [P13]

One participant asked for more clarity issues around the certification in the course, namely what it is and what they are awarded through the course:

the certification, this would be a completed certification that you have-- and I don't know. I don't know the course. Is it a certified course? Is it a certification course, or a degree course, or-- you understand? The reason behind it is that once you take-- in a way, it is a continuous improvement programme in your work. Understand? So as we are doing such courses, it's also-- apart from enhancing your learning, it also adds to your CV. So if you are going for an interview and say you have done this programme, I've done this course. And then you have to prove it. So that is very important [P13]

Given this input, a way forward for the OU would be to consider working with local regulatory bodies so any courses or events are locally recognised and participants can get credits for their participation. Further suggestions included to consider AMR pathways that will allow professionals in this field to demonstrate progression and finally, to provide follow-ups to the data course to be included with an expanded provision of programmes on AMR.

7. Technology-supported Capacity Building on AMR Surveillance: Key Findings and Recommendations

The learning events were an Open Online Course entitled *Understanding Antibiotic Resistance*, and a Blended Learning Event, entitled *The Power of Data to tackle AMR* which was partly online and partly face-to-face, focussed around specific workplaces. The two events were designed differently: the Online Course provided foundational knowledge on AMR and raised awareness; the Data Event provided hands-on, practical experience on the analysis of AMR data and encouraged participants to reconfigure their workplace. Each of these events offered a distinct range of learner benefits that were realised through the learning design process adapted from the scoping phase. These benefits and the process are summarised below:

Learner Benefits Realised

- 1. Participation in each of the learning events increased appreciation of the scale of the challenge of AMR and the importance of the surveillance system.** In particular there was realisation that supporting AMR surveillance depends on people in diverse roles and on different sites working together within well-functioning networks.
- 2. There is evidence that participants appreciated better the role of the lab in the surveillance system after engagement in each event.** This is important because lab work is often perceived as being in the margins of the medical profession. Understanding that AMR surveillance work is valuable and can make a significant difference to a patient helps improve motivation for lab professionals within a human health setting.
- 3. Engaging participants in each of the learning events triggered a shift in perceptions of open, online and distance education (ODL) and increased acceptability of ODL as a form of quality education.** As expected, most participants had limited prior experience in online learning, but the evaluation provided evidence to show that participants have a better appreciation of the value of online and distance education. This included participants recommending the courses to colleagues and confirming their intention to continue engaging in online learning.
- 4. Participation in each of the learning events supported improvement in general knowledge about AMR and the AMR surveillance system.** Evidence generated showed an increase in participants' knowledge about AMR and development of a specialist AMR vocabulary, as well as an increase in their confidence in this domain.
- 5. The Data Event, designed around specific workplaces and participation in surveillance activity, enabled participants to learn about tools, techniques and practices appropriate to their role.** The majority of Data Event participants referred to specific techniques for AMR data analysis they learned through participation, while the senior lab people reported greater

understanding of how to report and communicate AMR data results to their senior colleagues in the facility.

6. **Through engaging in the learning events, participants incorporated inter- and intra-professional communication into their everyday actions.** Bringing together groups of individuals working in the same facility, as well as across facilities and sectors, helped people reflect on and change some ingrained professional practices. It also gave opportunity for inter- and intra-professional communication. This may be because participants had opportunity to interact with diverse groups of colleagues during the learning events. There was evidence that senior lab people identified possibilities for surveillance improvements which were not previously aware. Some of these improvements might be relatively easy to implement, such as improved communication in clinical meetings, making sure test results were communicated in a way that was useful to the person receiving the data and so on. We have evidence that improvement actions have already taken place, for example review processes have been initiated with request forms for specific lab tests, processes for staff to request specific lab diagnostics to identify organisms that cause animal infections and so on. These improvements provide evidence of senior staff allowing technical staff to contribute more to overall improvements within the workplace.
7. **There is evidence of increased awareness of poor practice associated with AMR surveillance.** There was an appreciation that good surveillance practice relies on data flow across local, national and global networks. Participants reported they are more able to recognise and rectify poor practice within their facility and are more likely to take action to address this, such as the Lab scientist who reported they now check when data is missing and reports when it is inaccurate and the vet services professional who recognised that they and their colleagues' prescribing practices were not appropriate.

However, there are outstanding problems that need to be addressed in the next phase of work.

8. **Time, work responsibilities and Internet connectivity were barriers for professionals to take part and/or complete the two learning events.** These issues were raised repeatedly in the evaluation as reasons why participants could not spend more time in their learning, did not take part in certain activities (e.g. forum discussions, learning journal), or did not complete certain weeks of learning. A high percent of participants chose to study at their workplace only, due to having more reliable access to the Internet. Both events required high levels of commitment from the learners. For example, in the online course they were required to study for a minimum of 4 hours a week over eight weeks.

Learning Event Design Considerations

To realise the benefits outlined in the previous section, a number of design considerations had to be actioned:

9. **For learning to be effective, it was critical to consider the diverse perspectives of learners particularly from a work perspective.** The co-design approach enabled the work context to be an explicit consideration, supporting the design and implementation of learning events that were relevant and responsive to the needs of the target groups. It also allowed reaching out and working with target learners as well as individuals with strong expertise on AMR.
10. **A cross-functional, multi-disciplinary project team was crucial to the design and development of the learning events.** The importance of involving individuals from many disciplines within the development team was important. The co-design approach involved a core project team consisting of people sharing a range of expertise such as learning experts, data experts, microbiologists, learning designers, development experts, production managers and educational researchers.
11. **Learner profiles, illustrating the characteristics of learners, proved a useful way to aid the design and development of learning events.** These profiles helped support consideration of who the learners are and how the learning events could be supporting them effectively in their roles in professional settings. This helped support the design of a flexible experience that led to high levels of student satisfaction.
12. **The mode of delivery of the learning events opened access to professional learning to people who have limited access to professional development opportunities.** For the majority of participants, this was their first opportunity to learn about AMR surveillance. Both learning events had positive feedback. The design of the Data Event enabled participants to learn with colleagues from their own workplace. This encouraged people to continue to communicate after the event and consolidate the learning.
13. **Support by in-country individuals was an important aspect of the recruitment of participants and also impacted upon the dissemination of information about the learning events.** Support from in-country professionals who worked closely with the OU research design team helped promote the learning events within specific facilities and provided support in the recruitment of participants, both during the learning events but also for the evaluation process.

Recommendations

Key recommendations have been identified to guide future work of the OU within the Fleming Fund. In consultation with DHSC and Mott MacDonald some recommendations have been prioritised and have been factored into design of Grant 2. Others are recommendations for the longer-term and possible subsequent grants.

1. **Create effective and flexible multi-disciplinary project teams to lead on the design and development of the various OU learning events.** Early planning is needed in terms of the roles and expertise required in the various phases of Grant 2, as well as good estimation of time and correct scheduling to allow for teams to be formed on time and lead the development,

implementation and evaluation of modules / courses within Grant 2. Logistical support, especially within Objective 3, is critical and will be beneficial to identify in-country individuals in the five target countries to support work early in the process of Grant 2. Similarly, technical support is needed, and formal allocation of roles and time of individuals involved in specific phases (e.g. subject matter experts from Mott, academics, evaluators) as well as investment in initial co-located, face-to-face meetings as a project team will be beneficial in the development and implementation of Grant 2.

2. **Use a co-design process to design and develop learning events.** Co-design methodology brings together key stakeholders to inform the design of the learning events. This process ensures that the events provide learning experiences that are responsive and relevant to the needs of the various target learners. The co-design process should be expanded to include other target groups beyond laboratory professionals, as identified in the ToR for Grant 2 (e.g. clinicians, vets, and nurses). More involvement of learners in all phases of the development of the learning events and their evaluation, and not only in early stages or summative assessments, is important.
3. **Create a wider set of learner profiles, illustrating the characteristics of learners, to include other professionals being targeted in the development of the curriculum and events.** In Grant 1 there was a requirement to focus on one particular profile of professionals. Grant 2 broadens the scope of the work to include clinicians, members of AMR committees, pharmacists, vets, animal health professionals, and other professional groups involved in AMR surveillance activity. It aims to reach a wider group of professionals in surveillance networks, therefore there is a need to consider development of evidenced-based profiles for learners beyond lab professionals, as identified in the ToR for Grant 2.
4. **Expand the range of learning events to include further opportunities for online, blended and distance learning for professionals in AMR surveillance.** In the context of Grant 2, the two existing learning events should be re-used or re-purposed. This provision should be expanded and complemented with additional curriculum and learning events around key priority areas and knowledge gaps identified in the Scoping Phase in ways that will increase access to learning opportunities among professionals.
5. **Design learning events that aim to bring a change in professional practice.** The Fleming Fund has a great opportunity to accelerate impact on professional practice by ensuring that work practice and work contexts help inform the development and implementation of curriculum. There should be particular attention given to offering opportunities for professionals to collaborate and engage in inter- and intra-professional communication.
6. **Consider the provision of shorter modules and courses to accommodate professional responsibilities among professionals.** There is a need to create modules that can be completed in a shorter time with micro-credentials as rewards upon completion. For example, the Online Course *Understanding Antibiotic Resistance* could be broken into three distinct micro-modules that are 2-3 weeks in duration and require, 2-3 hours study per week. Micro-

credentials could be linked together through specific learning pathways, such as a Foundations in Microbiology pathway. Similarly, the event *The Power of Data to tackle AMR* could be offered as three micro-modules covering Introduction to Data, Data processing in a Facility and Data presentation and reporting (each 2 weeks with 2-3 hours study per week).

- 7. Formalise partnerships with local or regional institutions to support the sustainability of learning event provision.** To increase the uptake of learning and ensure longer term sustainability, support should be given to local organisations to run and own the learning events enabling them to be adapted to a variety of work-based contexts. This would involve working with Fleming Fund country and regional Grantees and Host Institutions to identify partners who may be sub-contracted to help deliver some of the objectives of Grant 2.

The following recommendation, though not prioritised within Grant 2, should be considered for longer-term, subsequent grants.

- 9. Create opportunities to work with local organisations to provide accreditation for the modules/courses offered.** It will be beneficial to work with local authorities and bodies such as the Ministry of Health and the Ministry of Agriculture or local universities to fully endorse and recognise the online provision. This could be in the form of Continuous Medical Education (CME) credits that as identified in the Scoping Phase are essential within medical professions and may bring greater recognition and acceptance of the OU online learning provision.

On the basis of these findings and recommendations, the OU has proposed an approach to learning, meeting the needs of different professional groups in AMR surveillance networks, that will be implemented through the OU's Global Learning Grant (referred to as Grant 2). The purpose of Grant 2 is to produce sets of high-quality learning material that will address key knowledge and skills gaps at-scale. These learning materials will be aligned to Fleming Fund priorities and complement and enhance other Fleming Fund investments. They will be freely and openly available online. Grant 2 will also provide an opportunity for implementing a contextualised in-country approach to learning initially in 1 country, before rolling it out across a further 4 priority countries during project duration. It is proposed that Grant 2 will start in November 2019 and will be completed in September 2021.

Annex 1 Overview of the OU Scoping Phase

Phase 1 Scoping (April – December 2018)

Phase 1 began with a global scoping study involving desk-based research and interviews with international experts on antimicrobial resistance in order to identify changes needed to build capacity in AMR surveillance. The OU team then visited three LMICs (Bhutan, Ghana and Tanzania)¹⁸ to carry out a detailed analysis of the work practices of AMR surveillance among professionals. These included policy specialists and laboratory professionals located within a number of animal, agricultural and human health sites. In total the OU interviewed approximately 100 people. The team then carried out a thorough analysis of the knowledge and skills needed of professionals working at all levels in different animal and human health sites.

The OU also carried out a literature review to identify existing online resources on AMR surveillance to identify gaps and identify material that could be used to deliver learning events.

An interim report submitted to Mott MacDonald in November 2018 summarised the findings of the scoping phase and outline the approach to the piloting phase.

Findings from the Scoping Phase

Possible 'learners' / target groups

Through the analysis and synthesis of evidence the OU team identified the following categories of 'learners' or target groups for possible inclusion in the grant:

Category	Description
Lab Professionals	Lab technician, assistant, technologists, lab scientist (across sectors)
Senior Lab Professionals	Head/Manager of Lab, Head of Unit (across sectors)
Clinical Services Professionals	Clinicians, nurses, pharmacists, epidemiologists, superintended, clinical officers
Vet Services Professionals	Veterinarians, para-vets, Livestock professionals, field/vet officers, vet pharmacist
(Senior) Management staff in Clinical services	Head of Hospital, Chair of IPC committees / Drugs & Therapeutics / Resources
(Senior) Management in Vet Services	Director / Deputy of Vet Services
Policy makers	AMR Secretariat, Ministry Health, Ministry of Agriculture, Livestock, Fisheries, WHO, FAO, OIE
AMR Community / Experts	Academics, donors, Fleming Fund professionals, members of EAG, members of TAG, PhD students, FF fellows
Clinical and Veterinary services clients	Farmers/farm managers, patients, community pharmacies
The public	Members of the public

¹⁸ These countries were chosen based on geographical spread, and also how far the Country Grant making process had progressed in each, given that the OU work was taking place whilst Country Grants were being designed which created sensitivities in some places e.g. some other IECs.

Knowledge and skills categories

Nine key categories of knowledge and skills were identified as necessary to enable well-functioning AMR surveillance systems. Knowledge and skills given the highest priority included:

1. Communication, Collaboration & Advocacy,
2. Good Laboratory practice,
3. Foundations in Microbiology
4. Data Use for Diagnosis in Clinical & Vet Services.

Other priority areas were:

5. Diagnostics Stewardship
6. Molecular Advanced Microbiology
7. Data Use & interpretation for Public Health Policy
8. Surveillance System Planning & Implementation
9. One Health Multisectoral.

Barriers to delivering AMR professional development programmes

The team gathered evidence on a number of issues that impede LMICs from delivering sustained, well-resourced, high quality AMR professional development programmes.

The team found examples of good practice in professional development usually through individuals being funded to study abroad, through mentoring schemes, train the trainer programmes or, in some of the reference laboratories, through international collaboration. However, these professional development opportunities were patchy, and not always open to all. There were limited examples of sustained capacity development. It was evident that professionals at all levels, whether Assistants, Technicians, Lab Scientists or Lab Managers, need opportunities to expand their knowledge. The particular AMR knowledge and skills they needed to focus on depended, to some extent, on the job role of each individual.

The evidence also suggested that existing AMR (or health system) structures in LMICs systems were failing to routinely provide opportunities for professionals to engage with one another. This impeded multisectoral and interdisciplinary collaboration within and across settings (e.g. between reference labs and sentinel sites). Siloed working appeared to be the norm for the majority of professionals which is to the detriment of cooperative and collaborative forms of engagement and knowledge exchange.

At the same time, AMR surveillance activity was often in addition to or on top of other work that lab professionals carried out. These professionals were continually adapting their current practice, which increased their workload. They were often not clear about the whole surveillance system for pathogens, how their work fitted within the system and what value they contributed within the wider structure of roles and responsibilities. The novelty of AMR and its emergence as a global challenge provided a reason for this lack of clarity. ‘Surveillance practice’ needed to be defined and well communicated. It sometimes needed re-organisation of roles and introduction of new positions.

Availability and accessing of existing online resources

The scoping work established that there is a rich and diverse range of resources and guidance documents aimed at AMR that could be potentially used for learning. However, these are in the form of resource type content rather than whole courses, and there is limited evidence of the impact of the use of these resources in changing AMR surveillance practice. Resources are mainly focused on a generic clinical audience for human health, with little material aimed at lab professionals or veterinary practitioners. Resources are predominantly in English and there is a lack of country-specific learning content. What this means is that although some resources could re-used within learning events, there may need to be a high degree of contextualisation, and also supplementation with new material.

Staff in the three countries visited made extensive use of digital and online technologies, usually mobile phones. The OU team found email was not the best form of digital communication, and in at least one country, WhatsApp was the most effective way to connect with others. Some professionals at senior levels were familiar with MOOCs and had participated in these, though they did not report a corresponding change in their practice. Although digital technologies were used extensively, staff interviewed were not clear about how to 'learn' using available technology.

Annex 2 Co-design approach



Fleming Fund: Tackling Antimicrobial Resistance

Terms of Reference: Participation in co-design of learning events

Background

The Fleming Fund is a UK Government aid programme to help low and middle-income countries (LMICs) address priorities in tackling antimicrobial resistance (AMR). Mott MacDonald is leading work to strengthen surveillance of drug resistance and laboratory capacity and The Open University UK is working with them to design, deliver and evaluate a number of Learning Events on AMR. The Open University UK (<http://www.open.ac.uk/>) is a pioneer in distance learning and the world's leading distance and online education provider, with over 170 000 students.

Between January and June 2019, The Open University (UK) will design, deliver and evaluate two Learning Events in three target LMICs; Ghana, Tanzania and Bhutan. By Learning Event we mean, for example, an online course (e.g. MOOC) or a face-to-face event delivered in the country (e.g. Evidence Cafe). Draft outlines of the two learning events can be seen in appendix A. Learning event A will have a focus in Ghana and learning event B a focus in Bhutan. Both learning events will be available globally and the focus applied is related to the monitoring and evaluation that will be conducted. We would like participants from each of our focus countries to help us understand how best to design learning events that address their specific contextual needs and can help lab professionals in different countries make use of information related to AMR and change their work practices.

Objective and Purpose of participation in Co-Design

To ensure learning events have greatest chance of having a benefit it is important prior to commencing development to work together with those who the learning is targeted. This will enable us to develop an understanding of needs and validate ideas or concepts. The aim of the co-design is to test and adapt our approach based on the feedback that is received and ensure that the learning events respond to the learners' needs.

Scope of participation

We are looking for 16 people in total across our focus countries who are working in the field of laboratory practice mainly focussing on microbiology, this will be a mixture of technicians and line managers:

- Bhutan (6)
 - 4 people of the criteria; Lab Professionals, Senior Lab Professionals, Clinical Services Professionals, Vet Services Professionals
 - 2 people of the criteria; Senior Lab Professionals, (Senior) Management staff in Clinical services, (Senior) Management in Vet Services
- Ghana (6)
 - 4 people of the criteria; Senior Lab Professionals, (Senior) Management staff in Clinical services, (Senior) Management in Vet Services
 - 2 people of the criteria; Lab Professionals, Senior Lab Professionals, Clinical Services Professionals, Vet Services Professionals
- Tanzania (4)
 - 2 people of the criteria; Senior Lab Professionals, (Senior) Management staff in Clinical services, (Senior) Management in Vet Services

- 2 people of the criteria; Lab Professionals, Senior Lab Professionals, Clinical Services Professionals, Vet Services Professionals

(For Criteria descriptions see Appendix B)

The time commitment will be up to 3 hrs during January 2019 and will be split over 2 meetings; these meetings will either be held online over skype (or other discussion forum), telephone or via email. Participants will be sent a document beforehand and a series of prompts to think about in order to make some comment.

Outputs

The participants support in this co-design phase will ensure that country specific learner needs will be considered in the development of Learning Events in ways that will feed into national strategic interventions and activities. The Learning Events that will be designed and delivered by the OU until June 2019 and beyond will be available globally.

Participants of the co-design sessions and the wider AMR community will have the opportunity to be involved in learning events designed as a direct output of your support.

For more information please contact: Professor Allison Littlejohn, Academic Director of Digital Innovation, Open University UK Email: Allison.littlejohn@open.ac.uk;



TASK D: Learners' Profiles

Have a look at the following boxes prior to our meeting. Feel free to make notes or we can work through these together during our meeting.

On Page 2 you will see some questions within each box that you may want to consider when going through this task.

In our meeting we will use these areas to have a discussion around your work environment, your past and current learning experiences but also the type of learning experiences you would like to have in the future.

1. Name	2. Age	3. Work Role

<p>4. Studying in English How confident are you in studying in English? (1-5)</p> <table border="1"> <tr> <td>(1) Highly</td> <td>(2) Mostly</td> <td>(3) Slightly</td> <td>(4) Not very</td> <td>(5) not at all</td> </tr> </table>	(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all	<p>5. Using computers and the Internet How confident are you in using computers and the Internet? (1-5)</p> <table border="1"> <tr> <td>(1) Highly</td> <td>(2) Mostly</td> <td>(3) Slightly</td> <td>(4) Not very</td> <td>(5) not at all</td> </tr> </table>	(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all
(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all							
(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all							
<p>6. Understanding of AMR How confident are you feeling about your current understanding of Antimicrobial Resistance AMR (1-5)</p> <table border="1"> <tr> <td>(1) Highly</td> <td>(2) Mostly</td> <td>(3) Slightly</td> <td>(4) Not very</td> <td>(5) not at all</td> </tr> </table>	(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all	<p>7. Managing your own learning How confident are you about managing your learning? (1-5)</p> <table border="1"> <tr> <td>(1) Highly</td> <td>(2) Mostly</td> <td>(3) Slightly</td> <td>(4) Not very</td> <td>(5) not at all</td> </tr> </table>	(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all
(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all							
(1) Highly	(2) Mostly	(3) Slightly	(4) Not very	(5) not at all							

8. Motivation

What do you like about your job?

9. Work Environment and planning for learning

10. Technology (in the workplace and beyond)

12. Location and Time for learning

11. Past Learning Experiences (incl. online)

Give an example of a learning situation you engaged with in the past to develop new knowledge and skills for work (i.e. training, course, online resources)

Any other details you would like to share.

14. Is there anything else you would like to tell us regarding your learning in the workplace?

13. Future learning experiences

Think of the type of experience you would like to have in the future for 'learning at the workplace' (i.e. ideal learning situation).


TASK D: Learners' Profiles

Have a look at the following boxes prior to our meeting. Feel free to make notes or we can work through these together during our meeting.

On Page 2 you will see some questions within each box that you may want to consider when going through this task.

In our meeting we will use these areas to have a discussion around your work environment, your past and current learning experiences but also the type of learning experiences you would like to have in the future.

1. Name	2. Age	3. Work Role

4. Studying in English How confident are you in studying in English? (1-5) (1) Highly (2) Mostly (3) Slightly (4) Not very (5) not at all	5. Using computers and the Internet How confident are you in using computers and the Internet? (1-5) (1) Highly (2) Mostly (3) Slightly (4) Not very (5) not at all
6. Understanding of AMR How confident are you feeling about your current understanding of Antimicrobial Resistance AMR (1-5) (1) Highly (2) Mostly (3) Slightly (4) Not very (5) not at all	7. Managing your own learning How confident are you about managing your learning? (1-5) (1) Highly (2) Mostly (3) Slightly (4) Not very (5) not at all

8. Motivation

What do you like about your job?

Are you interested in learning or merely in solving problems?

What do you hope will change in your day-to-day job if you take part in this Learning Event?

9. Work Environment and planning for learning

Who decides what you need to learn?

How do you plan what you need to learn in the workplace? e.g. Do you have any annual planning with your manager?

What arrangements do you need to make before registering in this Learning Event?

10. Technology (in the workplace and beyond)

Do you have computer access at work? Home?

Do you have internet access at work? Home?

What devices would you use in this Learning Event?

12. Location and Time for learning

Where do you expect you will be able to study during this Learning Event?

How many weeks / hours of study would you expect the Learning Event to be?

11. Past Learning Experiences (incl. online)

Give an example of a learning situation you engaged with in the past to develop new knowledge and skills for work (i.e. training, course, online resources)

What made you look or sign-up for this?

What resources did you use?

Did you have to create anything? (e.g. notes, report)

Did you have to do or test something at work?

Did you talk to anyone else to discuss the value of your learning? (e.g. colleagues, manager)

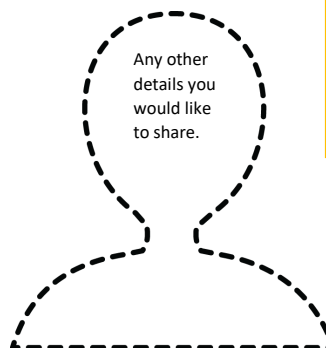
Did you make any personal or formal record reflecting on your learning?

Did you use your phone or computer?

How were you assessed?

Did you feel capable of managing your own learning in this situation?

Were you satisfied of the overall learning experience?



14. Is there anything else you would like to tell us regarding your learning in the workplace?

13. Future learning experiences

Think of the type of experience you would like to have in the future for 'learning at the workplace' (i.e. ideal learning situation).

Who would you like to interact with during the Learning Event?

What type of activities would you like to see?

How important is to make links to your job?

How would you like to be assessed about your learning?

What type of award or accreditation would you expect to get upon completion? E.g. badge, certificate, CPD credits

How would you like to share your learning?

Annex 3 Evaluation instruments

A. Fleming Fund Survey for the Open University Badged Open Course *Understanding Antimicrobial Resistance*

Thank you for considering taking part in the study by completing this survey. This study examines the role of the online Badged Open Course *Understanding Antimicrobial Resistance* in supporting and enabling learning for work. We particularly focus on professionals in public health facilities with an aim to gain an understanding about the role that an online course plays in relation to learning about antimicrobial resistance and your work in the facility. The study is carried out by a research team funded by the Fleming Fund at the Open University [\[link\]](#).

All participants registered for the Open Course 'Understanding Antimicrobial Resistance' have been invited to take part in a study by completing an online survey. All participants will get an invitation to another survey upon the completion of the course in an email and in end-of-course forum discussion. As with all aspects of the research element of this course, your participation is voluntary, and you will be free to withdraw data submitted from any aspect of the research until 31 July 2019 (phase 3a) or 30 Sept 2019 (phase 3b).

Participation in the study is separate from your participation in the online course and does not affect your course completion. This means that if you do not want any of your responses on the course to be considered for the research project, you can withdraw consent for us to use this without affecting your potential to complete the course and gain your certificate of participation. To withdraw your data, please contact us as indicated below.

You may find some more information about the study here helpful in making your decision for the project to use the data you provide and engage with the optional surveys and interview [\[link to participant information sheet\]](#)

In this survey you will be asked questions about you as a participant, how you found out about this course, what your expectations of the course are and what you hope this course will allow you to learn, especially in relation to your professional practice. It also includes some questions about previous experiences of your learning. It is organised into six sections (A-F) and will take you approximately 10-15 minutes to fill in this survey.

By taking part in this survey we assume you have given us your consent to use your responses as part of the Fleming Fund study. Data collected will be accessible only by the research team at the Open University and will not be shared with anyone without your approval. All data will be anonymised prior to publication and participants will not be identified.

If you have any questions about this study or would like to withdraw your data at any point up to the 31 July 2019, we would be happy to answer your questions and respect your wishes. Please contact:

Dr Koula Charitonos Lecturer, Institute of Educational Technology, The Open University,
Jennie Lee Building, Walton Hall, Milton Keynes, MK7 6AA, Tel: +44 (0) 1908 332757
koula.charitonos@open.ac.uk

Thank you very much for your time and input!

(new section)

SECTION A: About you

A1. Please tell us your gender:

- a. Male
- b. Female
- c. Prefer not to say

A2: Which country do you currently live in?

- a. Ghana
- b. Bhutan
- c. Tanzania
- d. Other*

If you selected Other, please specify: (free text)

A3. Please tell us your age:

- a. under 25
- b. 25-34
- c. 35-44
- d. 45-54
- e. 55-64,
- f. 65 and over

A4. Please tell us the highest level of qualification you might have?

- a. Secondary school certificate
- b. Certificate
- c. Diploma
- d. BA/BSc
- e. MA/MSc
- f. PhD
- g. No qualifications
- h. Other*

If you selected Other, please specify: (free text)

A5. Please tell us how many years of work experience in total do you have in the public health sector (i.e. human health, animal health, agriculture & livestock)?

- g. Less than 2 years

- h. 3-8 years
- i. 9-14 years
- j. 15-24 years
- k. 25 and over
- l. No experience

A6. On a scale between 1 and 5 (1=not at all, 5=highly) how confident are you in your level of English in:

4. What is your level of English?

	(1) None	(2)	(3)	(4)	(5) Fluent
Understand spoken English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speak English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Write English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Read English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A7. On a scale between 1 and 5 (1=not at all, 5=highly), how confident are you in using computers and the Internet?

Scale - (1) not at all (2) Not very, (3) Slightly, (4) Mostly, (5) Highly

(new section)

SECTION B: About your workplace

B1. Do you currently work for an organisation in the public health sector (i.e. human health, animal health, agriculture & livestock)?

- a. Yes
- b. No
- c. Prefer not to say

If yes: Carry on in this section B2

If no: Go to section D

B2. If yes, please tell us if the organisation you work for is:

- a. Human health sector
- b. Agriculture & Livestock
- c. Environment
- d. Other*

If you selected Other, please specify (free text)

B3. Where is your organisation located?

- a. Capital
- b. Urban area (other than the capital)
- c. Rural area

B4. Approximately how many members of staff does your organisation have? Please specify a number

Please enter a whole number and make sure the number is between 1 and 10000

B5. Please tell us how many years of work experience do you have in your current organisation?

- a. Less than 2 years
- b. 3-8 years
- c. 9-14 years
- d. 15-24 years
- e. 25 and over

B6. Is your organisation part of the AMR surveillance network in your country?

- a. Yes
- b. No*
- c. I don't know
- d. Prefer not to say

B6.1 If no: Will your organisation join the AMR surveillance network in your country in the future?

- a. Yes
- b. No
- c. I don't know

(new section)

SECTION C: About your role

C1. What's your role in this organisation?

- a. Laboratory Scientist
- b. Laboratory technician
- c. Laboratory Technologist
- d. Supervisor
- e. Laboratory Manager
- f. Head of the Laboratory
- g. Volunteer
- h. Other

If you selected other, please specify

C2. Please describe your role in one sentence: *What it is that you do?*

free text

C3. Which unit in your organisation are you based on? (e.g. in bacteriology, microbiology, serology)?

free text

C4. Approximately how many members of staff are there in your unit?

Please specify a number

Please enter a whole number and make sure the number is between 1 and 100

C5. How many years of experience do you have in this particular role?

- a. Less than 2 years
- b. 3-8 years
- c. 9-14 years
- d. 15-24 years
- e. 25 and over

C6. How often do you use your mobile phone at work for work-related matters?

- a. Multiple times in a day
- b. Once per day
- c. 2-3 times a week
- d. Once per week
- e. Rarely (once per month)
- f. Never
- g. I prefer not to say

C7. How often do you use a computer or a laptop at work for work-related matters?

- a. Multiple times in a day
- b. Once per day
- c. 2-3 times a week
- d. Once per week
- e. Rarely (once per month)
- f. Never
- g. I prefer not to say

C8. What do you like about your job?

Free text ...

(new section)

D. About the Online Course

D1. How did you find out about the online course 'Understanding antimicrobial resistance developed by the Open University?'

- a. from a colleague

- b. from a friend
- c. from the Open University website
- d. from a WhatsApp group
- e. from my professional group distribution lists
- f. the notice board in my organisation
- g. from AMR networks in my country
- h. Other

If you selected other, please specify....

D2. Please tell us if this is your first experience of taking part in an online course.

- a. Yes
- b. No
- c. I don't remember
- d. I prefer not to say

D3. Please tell us if this is your first experience of taking part in a (professional) programme on AMR.

- e. Yes
- f. No
- g. I don't remember
- h. I prefer not to say

D4. What made you sign up for the online course 'Understanding Antibiotic Resistance?'

Free text...

D5. Did you talk to someone at work about taking part in this online course?

- a. Yes
- b. No
- c. I prefer not to say

D5.1 If yes: What made you talk to him/her?

D5.2 If not: Who else should know about this? Free text (please do not refer to specific names, instead refer to roles)

D6. What do you expect will change in your day-to-day job if you take part in this online course?

Free text

D7. What will help you complete this 8-week course on time?

Free text

D8. What will make this online course useful for you? (tick more than one)

- a. Access to resources on AMR (e.g. videos, articles)
- b. Access to professionals in my country
- c. Access to professionals in other countries
- d. Practical examples related to my role at work
- e. Knowledge on antimicrobial resistance

- f. Knowledge on antimicrobial resistance surveillance system
- g. Specialised terms/vocabulary relevant to AMR I could be using in my job.
- h. Other*

If you selected other, please specify...

D9. Did you set yourself some specific goals prior to starting the online course?

- a. Yes*
- b. No
- c. I don't need to
- d. I never do.
- e. I prefer not to say

D9.1 If yes: Can you please summarise your main goals? Free text

D10. Please tell us if you heard of the Open University before?

- a. Yes
- b. No
- c. I don't know

(new section)

E. About your understanding of antimicrobial resistance

Table (scale 1-5)

E1. On a scale between 1 and 5 (1=not at all, 5=highly), how confident do you feel about:

Scale next to statements - (1) not at all (2) Not very, (3) Slightly, (4) Mostly, (5) Highly

- a. your current knowledge and understanding of Antimicrobial resistance?
- b. talking to a colleague about antimicrobial resistance?
- c. talking to a member of your family about antimicrobial resistance?
- d. the ways your work role contributes to tackling AMR?
- e. your organisation's role in relation to AMR
- f. the significance of AMR as a global issue?
- g. the significance of AMR as an issue locally?
- h. your current knowledge and understanding of AMR surveillance?
- i. your current use of specialised terms and vocabulary relevant to AMR?

E2. Please tell us if you heard of the Fleming Fund before.

- d. Yes
- e. No
- f. I don't know

(new section)

F. Planning your learning

F1. Please describe how you expect studying on this online course to contribute to your work or professional practice around antimicrobial resistance (or other studies)?

Free text

New page

F2. What will make you use and apply what you will be learning in this course in your job in the future?

Free text

Final page

Thank you!

Fleming Fund: Tackling Antimicrobial Resistance Project

Funded by UK Aid, Dept of Health and Social Care through Mott MacDonald

The Institute of Educational Technology and the International Development Office at the Open University are leading this research, aiming to examine how online learning supports and enables learning for work.

We'd like to thank you for your time in taking part in this survey!

Your opinion is highly valued by the Open University and the Fleming Fund.

If you have any other questions, we would be happy to answer them. Please contact: Dr Koula Charitonos, Email: koula.charitonos@open.ac.uk, Phone: 01908 332757

B. Post-course Survey for the Open University Open Course 'Understanding Antimicrobial Resistance' as part of the Fleming Fund

Thank you for considering taking part in the study by completing this survey. This study examines the role of the online Fleming Fund Open University Course about *AntiMicrobial Resistance (AMR)* in supporting and enabling learning for work. We particularly focus on professionals in facilities (e.g. human health, animal health, food, environment) with an aim to gain an understanding about the role that an online course plays in relation to learning about antimicrobial resistance and your work in the facility. The study is carried out by a research team funded by the Fleming Fund at the Open University <https://iet.open.ac.uk/projects/fleming-fund-tackling-antimicrobial-resistance>.

All participants registered for the Course have been invited to take part in a study through an information sheet. One of the data collection methods is by online survey and this is the post-course survey for the Course. Included in this survey at the end is an invitation to have an interview with a member of the project team. There will be an additional consent form for the interview which you should complete if you wish to take part in these. As with all aspects of the research element of this course, your participation is voluntary, and you will be free to withdraw data submitted from any aspect of the research until 31 July 2019.

Participation in the study is separate from your participation in the online course and does not affect your course completion. This means that if you do not want any of your responses on the course to be considered for the research project, you can withdraw consent for us to use this without affecting your potential to complete the course and gain your certificate of participation. To withdraw your data, please contact us as indicated below.

In this post-course survey, you will be asked questions about you as a participant, how you found out about this course, what your expectations of the course are and what you hope this course will allow you to learn, especially in relation to your professional practice. It also includes some questions about previous experiences of your learning. It is organised into three sections A-C and will take you approximately 20-25 minutes to fill in this survey.

By taking part in this survey we assume you have given us your consent to use your responses as part of the Fleming Fund study. Data collected will be accessible only by the research team at the Open University and will not be shared with anyone without your approval. All data will be anonymised prior to publication and participants will not be identified.

If you have any questions about this study or would like to withdraw your data, we would be happy to answer your questions and respect your wishes. Please contact:

Dr Koula Charitonos Lecturer, Institute of Educational Technology, The Open University,
Jennie Lee Building, Walton Hall, Milton Keynes, MK7 6AA, Tel: +44 (0) 1908 332757
koula.charitonos@open.ac.uk

Thank you very much for your time and input which will benefit future professionals who will take part in this online course.

SECTION A: About your experience as a participant in the Online Course

A1. Have you taken an online course for work-based learning before?

- a. Yes*
- b. No
- c. I don't remember

If Yes: **A2.1 What, if any, are the differences between this online course and any other online learning for work you did in the past?**

Free text

A2. What was your primary motivation for taking this online course?

Free text ...

A3. On a scale between 1 and 5 (1=not at all, 5=highly), how confident do you now feel now that the course has been completed about:

Scale next to statements - (1) not at all (2) Not very, (3) Slightly, (4) Mostly, (5) Highly

- j. your current knowledge and understanding of Antimicrobial resistance?
- k. talking to a colleague about antimicrobial resistance?
- l. talking to a member of your family about antimicrobial resistance?
- m. the ways your work role contributes to tackling AMR?
- n. your organisation's role in relation to AMR?
- o. the significance of AMR as a global issue?
- p. the significance of AMR as an issue locally?
- q. your current knowledge and understanding of AMR surveillance?

A4. How much time did you use on your studies in the online course per week?

- a. Less than one hour
- b. 1 to 2 hours per week
- c. 3 to 4 hours per week
- d. 5-6 hours per week
- e. More than 6 hours per week

A5. What has been the main location of your studies (i.e. where were you when studying for the course)?

- a. My home
- b. My workplace
- c. Both home and workplace
- d. Other*

If you selected other, please specify:

A6. Which devices did you mainly use to access the course materials?

- a. Computer / Laptop
- b. Mobile phone
- c. Tablet
- d. All the above or combination of the three options above
- e. None of these*

If you selected None, please specify:

A7. Please tell us how useful you found the following features to your learning. If you haven't engaged with these please tick 'I did not use this'.

Table with statements: Very useful, slightly useful, not very useful, no useful at all, I don't know, I did not use this; against each statement.

- a. Videos
- b. Course step information about microbes, microbial resistance and tackling AMR
- c. Questions which asked you to reflect on your knowledge
- d. Questions which asked you to reflect on how the content related to your work
- e. Case studies/exemplar material
- f. Links to relevant sites which required you to find information
- g. Discussions on the course forum
- h. Your learning journal
- i. Discussions with colleagues at work/beyond the course

A8. How did you typically study in the online course over these last 8 weeks? Please describe.

Free text

(New section)

A9. The following questions are statements related to your learning in the course. Respond by choosing from a number of options on a scale. Indicate how you typically behaved in the Online Course rather than how you think you should have behaved. There are no correct or wrong responses to these questions.

1 = not at all true for me, 2 =sometimes true for me, 3 = quite true for me, 4 = true for me, 5 = very true for me; against each of these statements

i. Forethought

Goal setting

[SRLMQ-1][12-F-OSRL-1] I set personal standards for performance in my learning.

[SRLMQ-2] [13-F-OSRL-2] I set short-term (daily or weekly) goals as well as long- term goals (for the whole course).

[SRLMQ-3] [14-F-OSRL-4] I set goals to help me manage studying time for my learning

[SRLMQ-4] [NEW] I set realistic deadlines for learning.

Strategic Planning

[SRLMQ-5] [16-F-MAI-22] I asked myself questions about what I am to study before I begin to learn.

[SRLMQ-6] [17-F-MAI-23] I thought of alternative ways to solve a problem and choose the best one.

[SRLMQ-7] [18-F-MAI-3] When planning my learning, I used and adapted strategies that have worked in the past.

[SRLMQ-8] [28-P-MAI-45] I organised my study time to accomplish my goals to the best of my ability.

Task interest/value

[SRLMQ-9] [20-F-MSLQ-4] I think I will be able to use what I learn in the future.

[SRLMQ-10] [NEW] [F-MSLQ-17] I was interested in the topics presented in this course.

[SRLMQ-11] [21-F-MSLQ-10] The learning that I undertook was very important to me.

(New section)

A8. The following questions are statements related to your learning in the course. Respond by choosing from a number of options on a scale. Indicate how you typically behaved in the Online Course rather than how you think you should have behaved. There are no correct or wrong responses to these questions.

1 = not at all true for me, 2 = sometimes true for me, 3 = quite true for me, 4 = true for me, 5 = very true for me; against each of these statements

ii. Performance

Self-efficacy

[SRLMQ-12] [48-F-OS-10] I could cope with learning new things because I could rely on my abilities.

[SRLMQ-13] [49-F-OS-2] When confronted with a challenge I could think of different ways to overcome it.

[SRLMQ-14] [50-F-OS-3] I felt that whatever I was asked to learn, I could handle it.

[SRLMQ-15] [51-F-OS-4] My past experiences prepared me well for new learning challenges.

[SRLMQ-16] [52-F-OS-5] I met the goals I set for myself in this course.

[SRLMQ-17] [53-F-OS-6] I felt prepared for the demands of this course.

Task strategies

[SRLMQ-18] [23-P-MAI-37-39-41] I tried to translate new information into my own words.

[SRLMQ-19] [24-P-MAI-43] I asked myself how what I am learning is related to what I already know.

[SRLMQ-20] [25-P-MAI-40] I changed strategies when I did not make progress while learning.

[SRLMQ-21] [26-P-MSLQ-32] When I studied for this course, I made notes (e.g. in my learning journal) to help me organize my thoughts.

[SRLMQ-22] [NEW](MAI-31) I created my own examples to make information more meaningful.

[SRLMQ-23] [NEW] [P-OSRL 14] I read beyond the core course materials to improve my understanding.

Elaboration

[SRLMQ-24] [29-P-MSLQ-64] When I was learning, I tried to relate new information I found to what I already know.

[SRLMQ-25] [30-P-MSLQ-53] When I was learning, I combined different sources of information (for example: people, web sites, printed material).

[SRLMQ-26] [31-P-MSLQ-81] I tried to apply my previous experience when learning.

Critical Thinking

[SRLMQ-27] [32-P-MSLQ-51] During learning I treated the resources I found as a starting point and tried to develop my own ideas from them.

[SRLMQ-28] [33-P-MSLQ-66] I tried to play around with ideas of my own related to what I was learning in this course.

[SRLMQ-29] [34-P-MSLQ-71] Whenever I read or heard an assertion in this course, I thought about possible alternatives.

Help seeking

[SRLMQ-30] (35-P-MSLQ-68) When I did not understand something, I asked others for help.

[SRLMQ-31] (36-P-MSLQ-75) I tried to identify others whom I could ask for help if necessary.

[SRLMQ-32] [NEW] (LS-15) I asked others for more information when I needed it.

[SRLMQ-33] [NEW: REVERSED] (MSLQ-40). Even if I was having trouble learning, I preferred to do the work on my own.

Interest enhancement

[SRLMQ-34] (39- P-MSLQ-22) The most satisfying thing for me in this course was trying to understand the things I learnt as thoroughly as possible.

[SRLMQ-35] [40-P-MSLQ-24] I liked opportunities to engage in tasks that I could learn from.

[SRLMQ-36] [41-P-MSLQ-16] I preferred learning that arouses my interest, even if it was challenging.

(New section)

A9. The following questions are statements related to your learning in the course. Respond by choosing from a number of options on a scale. Indicate how you typically behaved in the Online Course rather than how you think you should have behaved. There are no correct or wrong responses to these questions.

1 = not at all true for me, 2 =sometimes true for me, 3 = quite true for me, 4 = true for me, 5 = very true for me; against each of these statements

iii. Self-reflection

Self-evaluation

[SRLMQ-37] [42-S-MAI-7] I know how well I have learned once I have finished a task.
[SRLMQ-38] [43-S-MAI-18] I ask myself if there are other ways to do things after I finished learning.

[SRLMQ-39] [44-S-MAI-24] I think about what I have learned after I finished learning.

Self- satisfaction/affect

[SRLMQ-40] [WLBK-45] (LS-5) I often think about how my learning fits in to the ‘bigger picture’ of my work/practice [e.g. AMR surveillance system]

[SRLMQ-41] [46-S-LS-7] I consider how what I have learned relates to my colleagues.

[SRLMQ-42] [47-S-LS-10] I try to understand how what I have learned impacts my work/practice.

Section B Reflections on the impact of the online course on your work practice

B1. What, if any, has changed as a result of you taking part in this online course?

Free text

Follow-up

1.1 How do you know that things have changed? Please give us an example which shows that you have used / applied your learning from the online course to think or do things differently at work. Leave blank if you have no example to share.

B2. What would you change in this online course?

Free text

B3. Please describe how you expect studying on this course to contribute to your work or professional practice from now onwards (or other studies).

Free text

B4. Would you like to tell us anything else that you feel it might be useful in our research and improve the online course for future learners?

Free text

(New section)

Finally, some questions about you and your workplace:

SECTION C: About you and your workplace

C1. Please tell us your gender:

- d. Male
- e. Female
- f. Prefer not to say

C2. Which country do you currently live in?

- e. Ghana
- f. Bhutan
- g. Tanzania
- h. Other

If you selected Other, please specify: (free text)

C3. Please tell us your age:

- m. under 25
- n. 25-34
- o. 35-44
- p. 45-54
- q. 55-64,
- r. 65 and over

C4. Please tell us what are the highest level of qualification you might have?

- i. Secondary school certificate
- j. Certificate
- k. Diploma
- l. BA/BSc
- m. MA/MSc
- n. PhD
- o. No qualifications
- p. Other

If you selected Other, please specify: (free text)

C4. On a scale between 1 and 5 (1=not at all, 5=highly) how confident are you in your level of English in:

4. What is your level of English?

	(1) None	(2)	(3)	(4)	(5) Fluent
Understand spoken English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speak English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Write English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Read English	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

C6. On a scale between 1 and 5 (1=not at all, 5=highly), how confident are you in using computers and the Internet?

Scale - (1) not at all (2) Not very, (3) Slightly, (4) Mostly, (5) Highly

C7. Do you currently work for a facility at the:

- e. Human health sector
- f. Agriculture & Livestock
- g. Environment
- h. Other*
- i. I don't work at a facility in the public health sector (i.e. human health, animal health, agriculture & livestock)*

*If you selected Other, please specify (free text)

**If e = then go to 'follow-on interviews section'*

All other answers go to C8

C8. Where is your organisation/facility located?

- d. Capital
- e. Urban area (other than the capital)
- f. Rural area

C9. Approximately how many members of staff does your organisation/facility have?

Please specify a number

Please enter a whole number and make sure the number is between 1 and 10000

C10. What's your role in this organisation/facility?

- i. Laboratory Scientist
- j. Laboratory technician
- k. Laboratory Scientist
- l. Supervisor
- m. Laboratory Manager
- n. Head of the Lab
- o. Volunteer
- p. Other*

If you selected other, please specify

C11. Is your organisation/facility part of the AMR surveillance network in your country?

- e. Yes
- f. No
- g. I don't know
- h. Prefer not to say

C12. How many years of experience do you have in the public health sector in total (i.e. human health, animal health, agriculture & livestock)?

- f. Less than 2 years
- g. 3-8 years
- h. 9-14 years
- i. 15-24 years

- j. 25 and over years
- k. No experience

(New page)

Follow-on interviews

We would like to follow-up on this survey with short interviews that will give us an opportunity to discuss with you in details aspects of the online course. If you agree, a member of our research team will get in touch with you shortly to agree the most convenient time and method (face-to-face in the case of the AMR data event in July, or by phone or online) at a time that is convenient for you. We will ask you a few questions about your experience in the online course, any benefits you may have and any issues you may have experienced, as well as how this course is linked to your everyday job.

Even if you tick 'Yes' below, you can change your mind and we will give you the option to withdraw from the interviews after we make any contact with you.

Would you like to be contacted for an interview?

- a. Yes
- b. No

If yes - Please state your email address here, if we may contact you regarding a follow-up interview: [comment box]

If no – go to final page

Final page

Thank you!

Fleming Fund: Tackling Antimicrobial Resistance Project

Funded by UK Aid, Dept of Health and Social Care through Mott MacDonald

The Institute of Educational Technology and the International Development Office at the Open University are leading this research, aiming to examine how online learning supports and enables learning for work.

We'd like to thank you for your time in taking part in this survey!

Your opinion is highly valued by the Open University and the Fleming Fund.

If you have any other questions, we would be happy to answer them. Please contact: Dr Koula Charitonos, Email: koula.charitonos@open.ac.uk, Phone: 01908 332757

B. Interview protocol and schedule for the Online Course 'Understanding Antimicrobial Resistance'

Prior to the interview

The purpose of the interview will have been outlined in the information sheet and the interviewee should be provided with this (again) along with the consent form for the interview when the time for the interview is agreed. A consent form is to be completed in advance of the interview and shared by email. If this is not possible it can be completed at the interviews (see arrangements below). When the interview is arranged it should be suggested that the participant might find the learning journal they completed for the course useful to have available to consult to help respond to some of the interview questions but that this will not be a problem if they did not complete one or it is not available.

Preliminary discussion

The interviewee should be asked whether they read the information sheet. If not, this should be read to the interviewee.

Summarise the purpose of interviews as finding out:

- *Your individual experiences of studying on the Online course while working in an organization which contributes to AMR surveillance*
- *Your experience in engaging in online activities and current work practice around surveillance.*
- *Your needs around training and Continuing Professional Development on AMR and opportunities available to you.*
- *The impact the online course has had or you are expecting it might have, especially in relation to your professional practice.*

If the consent form has not been submitted by email then this should be read out to the interviewee and verbal consent gained at the start of the recording, with the form submitted by email in confirmation.

It should be explained that:

"The interview is in three sections: about you, about your learning on the course, your suggestions for the future. It is intended to take no longer than 45 minutes. If you are being contacted using your phone line, a record of your number will be destroyed after the phone call has taken place."

Section A: About you

1. Please explain your role in your organization and what it involves (e.g. in reference lab, surveillance site)

2. Tell us about the people you are in direct contact with in everyday tasks. In each case, how does your role link to them?

3. Can you outline any challenges you see in your work and that of your organization in contributing to AMR surveillance?

4. Please summarise any training or other activities you have participated in about anti-microbial resistance prior to this Badged Open Course (incl. online). If so, can you outline how different the BOC experience has been for you, if any differences?

5. What types of opportunities are there for you in general to develop new skills / do things differently in AMR?

6. What, if any, do you like about your job?

7. Can you explain what has motivated you to undertake further study with the BOC?

Section B : About your learning on this course

(participants could be encouraged to refer to their learning journal as relevant in section B and C)

8. Please explain how you participated in this course. For example, did you participate in all the activities, all the forum discussions, complete the quizzes?

What did your participation require? (access, equipment, time, organization)

9. Could you share with us an experience from the online course/learning of what you felt to be an effective learning experience?

What made it effective?

10. Did you find any of the aspects of studying on the course challenging? Parts that didn't work well for you. For example, can you identify any challenges related to when the course ran, how it was designed or how, where and when you studied?

11. How did you find the inclusion of a learning journal in the course? How did that work for you? If so, please can you explain how did the journal contribute to your learning on the course? If not, can you help us understand what made you not use (or not complete) a learning journal?

12. What has your participation in the BOC enabled you to do as [a professional] that you couldn't do before? (give example)

Is this an important change for you? Why?

If nothing changed, why you were not able to benefit from this course yet ?

Please can you identify any particular parts of the course which helped this change.

e.g. views changed on what good practice is in AMR, discussions with colleagues, general view of learning for work

13. Did you discuss your learning on the course with anyone in your organization?

If so, did this lead to any changes in either the views of others or changes in practice? If not, what would it be required for any change to take place?

14. Could you share with us any (recent) experience at work, where you felt you were doing things differently because of participating in this course?

Please can you identify what changed and then link this to any particular parts of the course?

15. Do you have any thoughts following your participation in the course about how learning on the job should look like? For example, would you now like to participate in further work-related learning or would like to engage in other online courses?

Section C : Your suggestions for the future

16. As a result of completing the course, can you point us to an area of work related to AMR in your organization that requires change?

What, if any, might improve the way you doing things about AMR in your organization? Can you link this to any particular part of the course?

17. What, if any, The Open University could do in the future to improve the provision of learning for work?

16. Is there anything else that you think might be useful to us and the Fleming Fund team?

In conclusion, the following will be read:

“Thank you for your contributions. They will inform future work around AMR surveillance. We would like to reaffirm that you are welcome to withdraw any of the data you have provided and should let us know by contacting Koula Charitonos by email (using the email address on the information sheet) by 31 July 2019 in the case of phase 3a or 30 September 2019 in the case of phase 3b. If you want to contact someone beyond the immediate team, contact details are provided on the information sheet. We confirm that the data you have provided will not contain personal or identifiable information and will be safely stored on password-protected devices available only to members of the project team. The recording will be transcribed to create an anonymized version from which you and your organization setting cannot be identified. All original data on the project will be stored using the OU secure institutional data repository, as required by the Fleming Fund, and will be destroyed 7 years after the end of the project “