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Developing an Online, Asynchronous Course on WASH in Healthcare Facilities

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An abstract of
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Abstract

Developing an Online, Asynchronous Course on WASH in Healthcare Facilities
By Emily Schoendorf

Background: In 2021, 1.7 billion people globally were served by healthcare facilities (HCF) that lacked basic water services, putting them at greater risk of infection when receiving care. Though knowledge about the need for safe hygiene practices to reduce morbidity and mortality of patients has existed for centuries, it was not until 2015 that the alarm was raised globally regarding the lack of adequate water, sanitation, and hygiene (WASH) in HCF. Seeing a need to educate practitioners on the implementation of sustainable WASH in HCF programming, the Center for Global Safe WASH (CGSW) at Emory University has offered a course on WASH in HCF for distance learners since 2020. Course facilitators are seeking to restructure the course so it can be delivered asynchronously to reach a wider network of WASH practitioners. The purpose of this special studies thesis is to develop the content for CGSW's new asynchronous course offering: *WASH in Healthcare Facilities 101: Introductory Short Course.*

Methods: Developing the content of *WASH in Healthcare Facilities 101: Introductory Short Course* involved reviewing the original CGSW distance learning course materials, meeting with course facilitators to determine what materials should be kept, removed, added, or enhanced, and applying best practices for asynchronous adult learning.

Results: The content developed for the new asynchronous WASH in HCF is laid out in four modules consisting of 12 lessons and approximately 180 slides. Each lesson introduces a learning objective, delivers core learning material, and concludes by reiterating key messages related to the learning objective. Activities, reflection questions, and assessments are included within each module for effective adult learning.

Discussion: Malcolm Knowles' six principles of andragogy were applicable to the design of the new modules, and each principle was integrated within the course. Through the process of designing the new course, it became clear that reach and accountability are among the major barriers to achieving the vision for every HCF globally to have basic WASH services. The course addresses these barriers by providing a flexible asynchronous format to encourage broader course participation and emphasizes accountability and leadership as overarching themes.

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List of Acronyms

CAA	Computer-assisted assessments
CGSW	Center for Global Safe Water, Sanitation and Hygiene
HAI	Healthcare-acquired infections
HCF	Healthcare facilities
JMP	WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene
IPC	Infection prevention and control
LDC	Least developed countries
LMIC	Low-income and middle-income countries
MOOC	Massive open online course
UNICEF	United Nations Children's Fund
WASH	Water, sanitation, and hygiene
WHO	World Health Organization

Chapter 1: Introduction

Background on Water, Sanitation, and Hygiene in Healthcare Facilities

Access to water, sanitation, and hygiene (WASH) is vital for people's well-being and for providing safe healthcare. However, as of 2021, 1.7 billion people globally were served by healthcare facilities (HCF) that lacked basic water services, putting them at greater risk for infection when receiving care (WHO/UNICEF JMP, 2022). Further, half of HCF worldwide lack a basic hand hygiene service, one-fifth lack a basic water service, and one-tenth lack any sanitation service. In the least developed countries (LDCs), the availability is even lower; two-thirds of HCF lack a basic hygiene service, half lack a basic water service, and four-fifths lack basic sanitation services (WHO/UNICEF JMP, 2022).

WASH in HCF refers to all WASH infrastructure, resources, services, and practices within healthcare settings. A healthcare setting includes any location where a patient can receive care, from a small office, to a clinic, to an acute care hospital (Christensen & Fagan, n.d.). Innumerable routine practices take place in HCF that require access to WASH - for example, hand hygiene, wound cleaning, sterilization of medical equipment, biohazardous waste, and fecal waste management. These practices are also critical for infection prevention and control (IPC), because they help to prevent the spread of disease both within the HCF and in the broader community (Centers for Disease Control and Prevention, n.d.).

While knowledge about the need for safe hygiene practices to reduce morbidity and mortality of patients has existed for centuries, it was not until 2015 that the alarm was raised globally regarding the lack of adequate WASH in HCF (Velleman et al., 2014). The World Health Organization (WHO) and United Nations Children's Fund (UNICEF) published a report that not only began to lay out the dire conditions of WASH in HCF, but also highlighted a lack

of data on WASH in HCF in many countries (WHO & UNICEF, 2015). In 2018, the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) identified five major components within WASH in HCF and launched core indicators for global WASH in HCF monitoring (WHO/UNICEF JMP, 2018).

The five components of WASH in HCF identified by the JMP are water, sanitation, hygiene, waste management, and environmental cleaning. Since 2019, JMP has maintained a global database specific to WASH in HCF, which tracks the five components, and defines basic services for each as the following:

- **"Water:** Water is available from an improved source on the premises.
- **Sanitation:** Improved sanitation facilities are usable, with at least one toilet dedicated for staff, at least one sex-separated toilet with menstrual hygiene facilities, and at least one toilet accessible for people with limited mobility.
- **Hygiene:** Functional hand hygiene facilities (with water and soap and/or alcohol-based hand rub) are available at points of care, and within five metres of toilets.
- **Waste management:** Waste is safely segregated into at least three bins, and sharps and infectious waste are treated and disposed of safely.
- **Environmental cleaning:** Protocols for cleaning are available, and staff with cleaning responsibilities have all received training" (WHO/UNICEF JMP, 2022, p. 7).

Health Implications of WASH in HCF

Without adequate WASH, patients are at higher risk of negative health outcomes. For instance, in resource-limited countries, healthcare-acquired infections (HAI) in hospital-born babies are 3 to 20 times higher than in settings with abundant resources, rates that are likely underestimates (Zaidi et al., 2005). Neonates are already at a high risk of infection due to

immature immune systems, and external factors throughout the system of care at health facilities in resource-limited countries drastically increase the risk. Zaidi et al. (2005) lists these factors to illustrate and explain the high number of points at which neonates are at risk of HAI in both peripartum and postpartum settings. These points include lack of clean water, lack of soap, lack of environmental cleaning protocols, inadequate disinfection of instruments, and contaminated bottle feedings. This absence of supplies and processes is directly related to WASH in HCF components and activities.

There is evidence that WASH in HCF influences health outcomes. A recent systematic review found that hygiene interventions have a protective effect on HAI in low-income and middle-income countries (LMICs) (Watson et al., 2019). The hygiene interventions studied included education on hand hygiene, supervision of hand hygiene, education on sterilization practices, and the use of clean care delivery kits for childbirth. A separate systematic review on the impact of WASH in HCF on care-seeking behavior in LMICs found that in maternal healthcare, patients avoid or delay giving birth in a HCF with poor WASH services (Bouzid et al., 2018). Delay in care is associated with increased morbidity and mortality.

Global Action on WASH in HCF

In 2018, United Nations Secretary-General António Guterres issued a global call to action on WASH in HCF, saying “We must work to prevent the spread of disease. Improved water, sanitation and hygiene in health facilities is critical to this effort” (paras. 27-28). Guterres (2018) also emphasized that the issue of WASH in HCF is of increased urgency as climate change adds to the burden of water stress.

Further, in 2019, the World Health Assembly unanimously agreed to pass a new resolution which outlined Member States’ responsibilities to act on sustainable WASH in HCF

through national roadmaps, implementation of standards, and investment in WASH systems (Seventy-second World Health Assembly, 2019). Six months later, WHO and UNICEF presented a new approach known as the "8 Practical Steps" designed to provide guidance to UN Member States to improve WASH in HCF, The eight steps include (1) conduct situation analysis and assessment, (2) set targets and define roadmap, (3) establish national standards and accountability mechanisms, (4) improve and maintain infrastructure, (5) monitor and review data, (6) develop health workforce, (7) engage communities, and (8) conduct operational research and share learning (WHO/UNICEF, 2019).

WHO and UNICEF's global vision on WASH in HCF is that "every health care facility has the necessary, functional and sustainable WASH services and practices in order to provide quality essential health services for everyone, everywhere" (WHO & UNICEF, 2020, p. 7). Target metrics to achieve this vision are first to reach 80 percent coverage of basic WASH services in HCF worldwide by 2025, and then to achieve universal access to basic WASH services by 2030 (WHO & UNICEF, 2020, p. 2).

While there has been some progress in addressing the lack of adequate WASH in HCF, there remain gaps in knowledge and action in part due to the issue not receiving global attention until 2015. On the research side, there is a growing body of data and studies surrounding WASH in HCF conditions, infrastructure, and implementation, but little research on the role of health systems, enabling environment, sustainability, gender, or enterprise in WASH in HCF. Moreover, while there is existing evidence linking different dimensions of WASH in HCF to health outcomes (e.g., hand hygiene), the volume of research on other aspects of linking WASH to health outcomes is limited. This dearth of literature has implications for evidence-based development activities in the WASH and health sectors. An increase in applicable knowledge on

WASH in HCF is critical to reach the 2030 target of universal access to basic WASH in HCF services. There is also a need to educate practitioners on the issue of WASH in HCF (in general) and a specific need to provide practitioners, policy makers and others with knowledge to advocate for the implementation of sustainable WASH in HCF programming.

Background on the Center for Global Safe Water, Sanitation and Hygiene

Since its founding in 2004, Emory University's Center for Global Safe Water, Sanitation and Hygiene (CGSW) has been committed to increasing access to WASH in resource-limited countries through approaches such as training, research, and capacity development (Center for Global Safe WASH, n.d.). CGSW is a leader in the field of WASH in HCF, having provided trainings to over 500 healthcare and WASH professionals in dozens of countries. Faculty and staff members of CGSW launched the WASH in HCF Community of Practice, which works to improve WASH in HCF by connecting stakeholders in WASH and health, sharing experiences and ideas, and encouraging individuals and groups to take action to advance global WASH in HCF through evidence-based approaches (WASH in Health Care Facilities Community of Practice, n.d.).

Since 2020, CGSW has offered a course to UNICEF staff (primarily) on the issue of WASH in HCF, with the objective of providing practitioners with the knowledge and skills to implement WASH in HCF programs. This long-distance course is delivered through 11 sessions, with eight live online sessions and three prerecorded sessions. The course focuses on the need for sustainable WASH solutions and the role of WASH in providing quality care and IPC. Session topics range from introducing and defining WASH in HCF, to conducting assessments and developing policy, to working at the facility level to deliver interventions. Participants ultimately

apply knowledge gained from the course sessions to design a practical workplan to implement WASH in HCF programming (Rollins School of Public Health, n.d.).

Purpose Statement

After completing five cohorts of the WASH in HCF long distance course, course facilitators at CGSW are seeking to restructure their training approach. CGSW recognizes a need to:

1. Reach a wider network of WASH practitioners outside of UNICEF
2. Streamline information in digestible modules
3. Prioritize skill-building among WASH in HCF teams
4. Deliver the course through an accessible asynchronous format that is sustainable for both course learners and instructors

The purpose of this special studies project is to develop the content of the new asynchronous *WASH in Healthcare Facilities 101: Introductory Short Course* that will be implemented by CGSW. To develop the content, there will be an examination of best practices for online asynchronous professional learning, a thorough overview of past course materials, and the design of new learning modules.

Chapter 2: Literature Review

I. Introduction

To design an effective asynchronous course on water, sanitation, and hygiene (WASH) in healthcare facilities, best practices and evidence-based approaches to asynchronous education must be considered. A literature review was performed to explore content areas such as characteristics of electronic learning (e-learning) and asynchronous learning, adult professional learning, and strategies to enhance the effectiveness of e-learning.

II. Overview of E-learning and Asynchronous Courses

History of E-learning

E-learning, or instruction via the internet or electronic media, has become an increasingly in-demand approach to delivering and receiving education. The popularity of e-learning education has been growing since well before the COVID-19 pandemic necessitated a transition to online learning (Sinclair et al., 2017). E-learning had already begun by 1994 in the form of digital CD-ROMs and early forms of online discussion forums (Weller, 2020). There are many synonyms for e-learning, including distance learning, electronic learning, online education, online learning, remote learning, and web-based learning.

E-learning Formats

Within the field of e-learning there are many approaches to course design. Synchronous online courses act as "virtual classrooms" in which lectures and activities take place in real time versus asynchronous online courses that are navigated individually at a self-determined time, and then blended courses combine multiple forms of online and in-person formats, as well as variations on synchronicity (Soll et al., 2021). All formats have advantages and disadvantages.

For example, while synchronous online courses are familiar to students accustomed to classroom learning, synchronous courses are not flexible for people with differing schedules.

Advantages and Disadvantages of Asynchronous Learning

Asynchronous courses are advantageous because their scheduling is accessible to students and instructors in different time zones as well as to those juggling work schedules and family responsibilities. Furthermore, the use of recorded videos in asynchronous courses is beneficial due to its flexibility. For example, students are able to manipulate the videos for their individual learning needs, for example through captioning, pausing, and interacting with course material at their own pace (Kelly, 2020).

A disadvantage to asynchronous learning is its reliance on self-motivation and self-pacing to make it through courses (Soll et al., 2021). Another disadvantage is the barrier the asynchronous format creates for social interactions within learning, which is important according to a social learning perspective (Hill et al., 2009). Smith and colleagues (2019) offer one potential way to counter this challenge, in which students complete asynchronous courses and then have the option to join a synchronous discussion about the course material. Smith (2019) calls for future research to explore the impact of such a synchronous, “face-to-face” session to supplement an asynchronous course.

III. Innovations in e-learning

Heutagogy

In considering the asynchronous format of e-learning, it is important to discuss the learning approach that supports independent learning: heutagogy. Heutagogy is the practice of self-determined and self-managed learning. Discussion of heutagogy began growing in the early

21st century after Hase and Kenyon (2000) first conceptualized it. Hase and Kenyon argued for going beyond a traditional "teacher-learner relationship" due to rapid changes in knowledge and workplaces, and a demand for immediacy in learning. They drew from multiple features of learning and human nature, including:

1. Psychologist Carl Rogers' concept of student-centered learning, which argues that people naturally want to learn throughout their lives, and that learning is significant only when self-determined
2. Argyris and Schon, who defined double loop learning as when one proactively adjusts goals or decisions based on experience and feedback to prevent issues, rather than relying on single loop learning when one reacts to issues with given strategies
3. Knowles' principles of andragogy, or adult education, which is discussed in detail in Section V of this chapter

These concepts and theories combine to form major principles of heutagogy: learner agency, self-efficacy and capability, reflection and metacognition, and nonlinear learning (Blaschke, 2021).

The growing mainstream use of the Internet propelled heutagogy mainly because of the quantity of user-generated content and social media available to individuals to direct their own learning (Blaschke, 2012). However, technology is not the only reason why some are shifting towards the practice of heutagogy. Bhoyrub (2010) argues that heutagogy is well-suited to practice-based settings such as healthcare, because these environments change rapidly and learners must be able to evolve and be prepared for lifelong learning in a complex environment. Heutagogy develops capacity for lifelong learning because it is centered around self-motivated

continuing development, rather than the educator providing information and skills that are then replicated by students (Bhoyrub et al., 2010).

Informed by her review of heutagogy, Blaschke (2012) outlined seven design elements useful to use in a heutagogical approach that place the learner at the center and promote reflection:

1. *"Learner-defined learning contracts"*

Individualized contracts between learners and educators support learners in developing expectations for themselves in how they can best internalize new learning. The State University of New York Empire State College uses such contracts to plan students' learning assignments and activities, learning outcomes, and evaluation methods (SUNY Empire State College, 2017).

2. *"Flexible curriculum"*

The curriculum is adaptable based on the student's needs.

3. *"Learner-directed questions"*

Guiding learners to ask questions that result in individual reflection and group discussion between educators and peers is vital to processing course material.

4. *"Flexible and negotiated assessment"*

The learner plays a role in planning assessments that take place throughout the learning process. This design element is made easier when learning contracts are used, because assessment planning can be done during the writing of the contract. This kind of assessment can help lessen the feeling of threat surrounding instructor-defined assessment while maintaining quantifiable outcomes using tools such as rubrics.

5. *"Learning journals"*

Learners reflect on material and ideas that arise during learning. This practice also promotes continual reflection beyond the scope of the course.

6. *"Action research"*

Examining and adjusting teaching and learning practices in real-time as the course progresses.

7. *"Formative and summative assessment"*

Assessments and feedback that take place throughout the learning.

While heutagogy provides foundations for lifelong learning and develops skills to deal with complex issues, there are limitations to the practice. Students can find it difficult to adjust to taking more responsibility for their learning and relying less on instructor directives (Blaschke, 2021). Additionally, heutagogy is still an emerging and evolving approach to learning and future research will help develop the practice (Bhoyrub et al., 2010; Blaschke, 2021). The nature of the restructured *WASH in Healthcare Facilities 101: Introductory Short Course* as an asynchronous, predetermined program precludes the application of many heutagogical elements such as learner-instructor contacts and group discussion. However, considering the principles of heutagogy could assist in designing a course that promotes reflection, application, and acting on concepts.

Microlearning

Microlearning refers to learning in short segments that allow students to stay focused and allows them to utilize material for just-in-time learning, or right when the need arises for that information (Thillainadesan et al., 2022). Similarly to heutagogy, the term microlearning grew in popularity in the early 21st century.

Thillainadesan (2022) describes four characteristics of microlearning:

1. *"Microlearning is short"*

There is varied information on what length the short segments should be. However, a scoping review of literature on microlearning in health professions education found that of the 17 total studies that qualified for the review, all of the microlearning content was under 15 minutes long (De Gagne et al., 2019).

2. *"Microlearning focuses on a single learning objective"*

Additional information that goes beyond the topic distracts from conveying the objective.

3. *"Microlearning can be achieved on the go when the learner wants it or needs it"*

The microlearning content is available to the learner asynchronously so they can look at it or revisit in at their time of choice or time of need.

4. *"Microlearning resources are most commonly and effectively delivered via digital technology (but microlearning is not defined by technology)"*

There are many forms of media for microlearning, including e-learning modules, videos, slides, and podcasts.

Microlearning can be advantageous because it provides flexibility to both students and instructors. Students enjoy the "gamification" that some microlearning education provides with interactive videos and exercises, and student success in the frequent exercises following small sections of material can promote confidence and motivation (Sozmen, 2022). A disadvantage of microlearning is the lack of clarity on whether microlearning leads to behavior change and application of the skills learned. Additionally, it is difficult to teach soft skills and analytical thinking through microlearning (Sozmen, 2022).

IV. Application of E-learning in Health Education

Asynchronous Learning in Health Education

In public health and health education, asynchronous e-learning has been an effective method of training. For example, after a fully online self-guided continuing education program on hand hygiene compliance for healthcare workers (n=256), 97% of the participants reported feeling the course was helpful in improving behaviors surrounding hand hygiene (Alemagno et al., 2010). The online program consisted of three sessions and a variety of elements, including a pretest and posttest, an instructional video, and a self-assessment. Ninety-six percent of the participants reported this method of instruction to be either 'very effective' or 'effective' (Alemagno et al., 2010). Additionally, an online asynchronous course on infection control and prevention in healthcare facilities saw a statistically significant increase in scores on competency questionnaires after students completed the course, with the mean score going from 64% to 77.3% after the course (Atack & Luke, 2008).

A systematic review focusing on the impact of e-learning on healthcare professionals' behavior and patient outcomes found e-learning to generally be at least as effective as traditional education in improving professionals' clinical skills (Sinclair et al., 2016). To measure the skills, studies included in the review used objective evaluations such as the Objective Structured Clinical Examination (Sinclair et al., 2016). Due to a lack of literature on randomized control trials that fit their rigorous inclusion criteria, Sinclair (2016) was unable to determine the effectiveness of e-learning on patient outcomes. This is an opportunity for future research.

E-learning in the WASH Sector

The international think tank IRC works to build strong WASH systems, and provides free asynchronous courses on global WASH issues through its WASH Systems Academy (IRC, n.d.).

Between its launch in 2019 and July 2021, the WASH Systems Academy had over 3,000 users registered from 110 difference countries, and seven different available courses (Leal et al., 2022).

Research was conducted on one of the courses between 2020 and 2021 to evaluate the performance of the course through different learning arrangements. The course 'WASH systems strengthening: the basics' was delivered in three different formats:

1. *Self-paced:* Open to anyone, students from 94 countries took the course in a self-guided manner, and had support via email
2. *Structured support:* Selected students in India took the course over one week and had three live webinars, group work, and a WhatsApp group for support
3. *Blended learning:* Selected students in Ethiopia took the course combined with face-to-face trainings over three days (Leal et al., 2022)

Leal and colleagues found that all three learning arrangements were effective when considering completion rates and student satisfaction. The completion rates for self-paced, structured support, and blended learning arrangements were 21%, 65%, and 100% respectively. While the self-paced arrangement had the lowest completion rate, it was higher than the average massive open online course (MOOC) completion rate (Leal et al., 2022).

V. Andragogy

Overview of Andragogy

Another important learning approach to consider is andragogy, or the practice of adult education and learning. Andragogy differs from pedagogy, the traditional practice of teaching, because it moves away from the reliance on a teacher and towards self-directed learning. In pedagogy, students are motivated externally by the teacher or another external source, who tells

the student what to learn and how to learn it. In contrast, andragogy students are motivated internally, wanting to develop skills for personal or professional development (Murray, 2018). While pedagogy was designed around educating children and dependent learners, andragogy focuses on adults, who thrive with independence (Center for Online Learning Research and Service, n.d.). Adult learners are generally defined as students ages 25 and older, and as a group have varied backgrounds, professional experience, and responsibilities (Southern Regional Education Board, n.d.).

Malcolm Knowles, an American educator, was instrumental in the expansion of the field of andragogy. Knowles developed a set of six core adult learning principles:

1. *"The learner's need to know".*

   To engage effectively in learning, adults want to understand why they need to know material and how they will learn it. Educators can help adult learners understand how the learning can improve their personal or professional lives.

2. *"Self-concept of the learner".*

   Adults value autonomy in learning. Instructors can guide adults from dependency, which they relied upon when learning at an earlier age, to self-directed learning.

3. *"Prior experience of the learner".*

   An adult learner's past experiences serve as resources and models for their learning. There is a broad range of experiences and backgrounds in a group of adults, and activities such as group discussions and case studies promote applying that experience and learning from peers. Educators can guide adult learners to re-examine past thinking and actions and discover different approaches.

4. *"Readiness to learn".*

Adults want to learn concepts and skills that they can apply directly to their lives and careers, and not simply what the instructor says they should know. Instructors can help promote readiness through techniques including simulations and real-world examples.

5. *"Orientation to learning".*

Adult learners orient themselves around problem-solving rather than building vast knowledge in a content area. Adults want to learn concepts and skills that they can apply to situations they encounter in their lives or work.

6. *"Motivation to learn".*

Internal motivators such as self-esteem and job satisfaction are intrinsic for adults. Understanding and using these internal motivations are important in adult learning. (Knowles et al., 2005, pp. 64-68).

Knowles (2005, p. 3) explains that while individual adult learners have different characteristics, the six core principles can be applied and adapted in many scenarios. For example, an adult learner can be highly autonomous, but choose to take a teacher-directed course on a certain subject matter because they feel it suits their learning style better. In this instance, the sense of personal autonomy overrides the sense of self-directed teaching (Knowles et al., 2005, pp. 185-189).

The first and fourth principles of adult learning are well-suited to apply to asynchronous learning. The first principle, the learner's need to know, can be addressed through providing overviews of why and how the course material is being taught. The fourth principle, readiness to learn, can be addressed through examining case studies and providing steps on how to apply skills learned in the online program.

Applications of Andragogy

Sharifi (2017) conducted a study on an English language course in Iran to examine differences between an experimental group where the principles of andragogy were used, and a control group that used teacher-centered pedagogy. The experimental arm applied andragogy by having students develop an e-portfolio throughout the course, in which the students built their own collection of work and had support and model e-portfolio assignments. The control arm did not use e-portfolios and received traditional methods of instruction, which emphasized lecture and memorization. The study found that on a posttest assessing new vocabulary learned, students in the e-portfolio group scored significantly higher than students in the control group (Sharifi et al., 2017).

Palis and Quiros (2014) provide guidance on applying adult learning principles to lecture planning. They recommend a simple needs assessment, such as asking a course facilitator about learners' current knowledge of the subject matter, or asking learners directly. The lecture can then be adapted to the specific needs of the audience. The needs assessment is linked to Knowles' principle *prior experience of the learner.* To prepare lecture slides, Palis and Quiros first recommend brainstorming all elements that come to mind on the subject matter and drawing from the brainstorming document for the slides. A three-part format of an introduction, a body, and a conclusion is helpful to structure the lecture. The introduction contains specific, measurable, achievable, realistic, and time-bound (SMART) objectives, describes the importance of the lecture, and provides an outline for what is to come. This aligns with Knowles' principles *the learner's need to know* and *motivation to learn.* The body provides the most important content on the lecture topic and should contain information about how the content is useful and applied in real-world scenarios. This draws from the principles of *readiness to learn* and

orientation to learning. Breaking up the lecture through questions or group discussions during the body of the lecture helps learners to keep attention and connect ideas. The conclusion reiterates the main points of the lecture. To promote student engagement, the authors suggest using strategies such as reflection questions and automated polling question (Palis & Quiros, 2014).

VI. Strategies for Effective Instruction in E-learning

Engagement

Engaging material is critical to keep learners' attention in e-learning. However, Sinclair (2017) highlights that "pedagogy must not be sacrificed for "edu-tainment" style instructional design," and that instructors must be knowledgeable about online educational technology in order to provide courses that are both high-quality and high-engagement. Sinclair and colleagues developed ten evidence-based design principles to consider when designing asynchronous e-learning courses:

1. *"Consider learner capabilities and existing knowledge"*

   It is important to take learners' knowledge of and access to computer and Internet into account, including bandwidth and streaming capacity. The designing process should also consider whether certain learners will come in with existing knowledge on the topic, and how the course can build on their knowledge while keeping them engaged.

2. *"Consider the programing to be utilized"*

   The educator must be proficient in the chosen platform for the course, and the platform must fit the goals of the course. The platform should not require more than an internet connection and browser for the course to operate.

3. *"Provide learning guidance"*

Because there is not access to immediate support or guidance in an asynchronous course, prewritten guidance must be provided. This guidance can be delivered through means such as prompts, icons, hints, scaffolding, and redirection.

4. *"Identify learning outcomes and ensure content will deliver"*

Providing learners with outcomes gives direction and focus to their learning. Having these defined learning outcomes also ensures that the person or team designing the course stays anchored to its objectives.

5. *"Conceptualize and create meaningful and engaging content"*

While designing interactive components to keep learners engaged, course designers must ensure that the interactive material is also high quality. Sinclair suggests using Microsoft PowerPoint as a tool to create a storyboard outline for the course that conceptualizes components including content, how the content will be interactive, and an accompanying narrative.

6. *"Present the stimulus material"*

The best way to deliver information without overburdening learners' working memory is to use "chunking", dividing up material into small modules, rather than providing all the information in a longer format. Additionally, core points of the modules should be accentuated with images, color, bolding, or other design elements. Audiovisual components should have a transcript available to ensure that neither audio playback technology or language proficiency prevent learners from accessing the full content.

7. *"Consider how you will capture and maintain the learner's attention"*

Multiple methods can be used to capture the learner's attention, such as providing a meaningful patient statistic, a brief video from an expert, or real-world scenarios and stories.

8. *"Design objective performance assessments and feedback"*

There should be frequent assessments, with immediate feedback provided to encourage further learning. This feedback should be clear and include information why an answer is incorrect. Learners should have multiple chances to redo questions to promote persistence.

9. *"Incorporate elements to enhance retention, transfer, and behavior change"*

E-learning courses should provide ways for learners to retain the concepts learned, through avenues like online quizzes or providing resources to additional readings. While there is evidence that e-learning leads to increased knowledge, there is not yet clear evidence on how e-learning impacts behavior change. Therefore, if behavior changes are part of the desired outcome of the course, attention should focus on what barriers have existed to those behavior changes in the past, and how those barriers can be overcome.

10. *"Incorporate peer review of content and resource evaluation"*

The course should be evaluated by experts in the subject matter as well as members of the target audience of the course. The course should be reviewed both before implementation and afterwards.

A study to develop indicators to measure student engagement in e-learning settings found there to be six components of e-learning engagement: psychological motivation, peer

collaboration, cognitive problem solving, interactions with instructors, community support, and learning management (Lee et al., 2019). An earlier qualitative study on intrinsic motivation in e-learning found that including a variety of learning activities enhanced by audio, video, and other technologies is an effective way to promote challenge, curiosity, engagement, and control in learners (Shroff et al., 2007).

There is overlap between elements that promote engagement in e-learning and Knowles' theory of andragogy. Sinclair's principle *"consider learner capabilities and existing knowledge"* is comparable to Knowles' third principle *"prior experience of the learner".* Both principles emphasize the use of learners' past experiences to enhance learning and. There is also a similarity between Lee's component of psychological motivation in e-learning engagement and Knowles' sixth principle "*motivation to learn".* In both concepts, internal motivation is important to meaningful learning.

Assessments and feedback in asynchronous e-Learning

While most synchronous courses provide regular instructor feedback through individualized comments on homework assignments and exams, assessments and feedback for asynchronous courses are often different. *WASH in Healthcare Facilities 101: Introductory Short Course* will be self-paced and will not include homework, projects, or other tasks to be graded by instructors. Therefore, careful considerations must be taken in the design of assessments and feedback to ensure that learners internalize the concepts taught in the course.

Feedback and grading on assessments done by technology is referred to computer-assisted assessments (CAA) feedback. CAA feedback is often immediate, for instance when online quizzes reveal correct and incorrect answers on the assessment just after a learner submits it. Although there is varied evidence as to how timing of feedback (immediate or delayed)

affects learning, one study on computer-based tutoring found that immediate feedback and correction led to more efficient learning than delayed feedback (Corbett & Anderson, 2001).

A drawback to CAA feedback is that it only judges a student's final answer and not the steps to get to the answer. For example, on a math problem CAA only requires the final answer compared to an instance where an instructor would be able to examine the student's process in developing the final answer. The computer is unable to determine the student's thinking and therefore their understanding of the material being assessed (Trenholm et al., 2015).

VII. Internet and E-Learning Globally

Developing countries and Least Developed Countries (LDC) have the largest gaps in WASH in HCF services (WHO/UNICEF JMP, 2022), and therefore it is important that *WASH in HCF 101: Introductory Short Course* material be available to practitioners in these regions. Access to Internet is a potential barrier that needs to be considered when designing the course.

As of 2021, it is estimated that in LDCs, there are 34 broadband (high-speed Internet) subscriptions per 100 people, compared to 77 subscriptions per 100 people in developing nations and 159 subscriptions per 100 people in developed countries (International Telecommunication Union, 2021). Of the 34 subscriptions per 100 people in LDCs, only 1 per 100 people is a fixed broadband connection. Fixed broadband connections are faster than mobile broadband and often needed to work with large files or stream high-definition videos (Whitacre, 2017).

To make e-learning accessible, it is important to consider the platform being used and ensure it can support tablets and smartphones if the learner is using mobile broadband on their electronic device (Sinclair et al., 2017). A best practice for e-learning accessibility is to use a program that students can operate in a browser without needing to install or download any software or other materials (Sinclair et al., 2017).

Conclusion

This concludes the review of relevant literature for the design of an asynchronous e-learning course. Asynchronous e-learning modalities are advantageous due to flexibility of scheduling for learners and instructors. Because there is more self-directed pacing in asynchronous learning than in synchronous formats, learning approaches such as heutagogy, microlearning, and andragogy were reviewed. Furthermore, strategies to promote engagement in asynchronous learning were examined. These approaches and strategies will inform the development of the new asynchronous course on WASH in HCF.

Chapter 3: Methods

Introduction

The purpose of this special studies thesis is to develop the content for CGSW's new online, asynchronous course offering: *WASH in Healthcare Facilities 101: Introductory Short Course.* One important consideration for this content development was to maintain the high-quality information and expertise found in CGSW's original synchronous course entitled "*WASH in Healthcare Facilities Distance Learning* Course" while transforming and adapting the content to fit a new asynchronous format. Additionally, while some of the learning objectives in the new course are similar to learning objectives in the original course, there are some key differences. For example, while some of the content was simply reformatted from the original course, other content was newly created. The author of this thesis met with the original course designers for a series of planning and workshop meetings over the course of twelve weeks to determine what content should be kept, removed, added, or enhanced. Evidence from the literature review was applied throughout the content development process. For example, knowledge from the literature informed the addition of module components to keep learners engaged, including the use of frequent assessments and reflection questions, the use of quotations and statistics to draw learners' attention at the start of each lesson, and summary slides for each learning objective. Other learning approaches used to transform the course will be mentioned in the Results chapter.

Materials

The content for the original CGSW course was made available to course participants via the online learning platform, Canvas. This author was given access to the original course's Canvas site to become familiar with the course materials. The original course contained 11 sessions that ranged in topic from introducing and defining WASH in HCF, to conducting

assessments, to working at the facility level to developing WASH in HCF interventions. Most of these sessions took place via synchronous, online course meetings in which course instructors delivered lectures accompanied by Microsoft PowerPoint slides. Recordings of course sessions as well as slide decks were made available on Canvas. In addition to the 11 sessions, the course included assigned readings and videos, and nine homework assignments that culminated in learners submitting a final workplan for a WASH in HCF program.

Original course designers provided this author with a list of original overall course objectives compared to updated overall objectives for the new course (Table 1). There is substantial overlap between original overall course objectives and the new overall course objectives, for example, defining and explaining WASH in HCF, and recognizing the necessity of cross-sectoral input, collaboration, and leadership. However, there is a difference in that the original course objectives extended further into the specifics of hardware and behavioral interventions. These topics were omitted from the new course, but will be part of a second short course designed by CGSW.

Original Objective	New Objective
1. Define and explain the various elements required for the implementation of WASH in healthcare facilities	1. Define and explain the various elements of WASH services in healthcare facilities and the underlying principles that link WASH to safe healthcare delivery.
2. Recognize the necessity of cross-sector input, collaboration and leadership in addressing the multi-sector problem of improving WASH in HCF	2. Understand the fundamentals of health systems strengthening, as well as the key health topics that require basic WASH services in healthcare facilities.
3. Discuss the importance of hardware interventions and (software) behavioral interventions to ensure the sustainability of WASH in HCF solutions	3. Recognize the necessity of cross-sectoral input, collaboration, and leadership in addressing WASH in healthcare facilities.
4. Apply the knowledge gained from webinar sessions, homework and group discussions to solve questions posed in case studies and practical exercises	4. Be familiar with the data sources, assessment tools, and strategies needed to analyze the status of WASH policies, guidelines, and services.
5. Apply the knowledge gained from webinar sessions, homework and group discussions to design and prepare a brief workplan that could be used in their current role.	5. Understand and be cognizant of the lessons learned to-date within the WASH in healthcare facilities sector.

Table 1. Original overall course objectives compared to new overall course objectives.

Each of the original 11 sessions contained several session objectives. The new course now has 4 modules (or sessions) that are broken up into several shorter lessons. Each module, will have two to four objectives. The original course designers provided a Microsoft Excel spreadsheet, excerpted in Table 2, that compared the old "session" objectives with the new "module" objectives, and included an "Actions" column outlining where to find relevant content in the original course. The actions column also noted key points to add or omit from existing content and demonstrated where new content needed to be created.

	Original Objective	New Objective	Actions
Module 3: Determining the Status of WASH in Healthcare Facilities Obj. 4 & Obj 3	1. Conduct situational and policy analyses and needs prioritization specific to WASH in healthcare facilities programming (Session 4)	1. Be familiar with the existing sources of data for WASH in healthcare facilities	Draw from original course Session 4 (as well as key points from Session 1). Include an emphasis on required collaboration.
	2. Select and deploy an appropriate WASH in healthcare facility assessment tool (Session 5)	2. Learn the basics of conducting a situation analysis for WASH in healthcare facilities	Draw from original course Session 4 (but can omit information on needs prioritization). Include an emphasis on required collaboration.
		3. Be familiar with the various tools available for assessment of WASH services in healthcare facilities	Draw from original course Session 5.
Module 4: Lessons Learned: WASH in Healthcare Facilities Experiences from Low-Resource Settings Obj. 5 & Obj. 3	**Original Objective**	**New Objective**	**Actions**
	N/A	1. Describe the 8 Practical Steps recommended for WASH in healthcare facilities	Draw from original course Session 11.
	N/A	2. Be familiar with common challenges faced by WASH in HCF implementation, as they relate to the 8 Practicals.	Create new content

Table 2. Excerpt from Module Objectives spreadsheet, comparing original session objectives to new session objectives and providing guidance for content creation.

Information provided in the four modules for the new course was either modified from the original course or created based on the WASH in HCF body of evidence. Key resources for the creation of new material were WHO and UNICEF reports, JMP reports, and the WASH in Health Care Facilities resource portal. Other examples of resources used for content are peer-reviewed studies and systematic reviews, United Nations web pages, World Health Assembly resolutions, and Centers for Disease Control and Prevention publications. All information sources and images were cited both on the slides where the information appears as well as on reference slides at the end of the lessons.

Population

The original course was delivered primarily to UNICEF country office personnel, and occasionally to learners from other organizations such as Rotary International and universities. The course went through five cohorts between 2020-2022, with a total of 198 learners from at least 25 countries. The new course is directed towards a wider network of practitioners. The target population of the new course includes:

- WASH practitioners
- Health practitioners
- International development practitioners
- Government officials
- Researchers

Planned Deliverables

The main deliverables for this project are slide decks for four new asynchronous course modules. The slides were developed using the Microsoft PowerPoint program. The course content is divided into four large modules, each with an overarching theme. Within each module is a series of two to four lessons, with each lesson focused on a specific learning objective. The content in each lesson was reduced compared to the content found in the original course sessions. These changes were made based on findings in the literature review that smaller segments within e-learning courses are more effective than presenting material in a longer format (Sozmen, 2022). Transition slides were created and placed at the beginning and end of each lesson to introduce and summarize learning the lesson's learning objective. These transition slides were designed based on guidance from the literature review to provide clear, singular learning objectives, and to conclude by restating the lesson's key points (Thillainadesan et al., 2022).

Content for the four new modules was primarily drawn from five of the 11 sessions in the original course. These original five sessions consisted of approximately 240 slides. In contrast,

the four new modules consist of approximately 180 slides. Further details regarding the content within the four new modules will be provided in Chapter 4.

In addition to creating new slide decks, evaluation questions were designed for learners to answer following select lessons and at the conclusion of every module. The original course assessed learners through manually graded homework assignments and a final workplan. The literature review provided evidence that assessments and feedback are important components of an asynchronous course because they help learners to internalize the course's concepts (Sinclair et al., 2017). Because graded assignments are not amenable to the design of the new, asynchronous course, assessments will instead be delivered through multiple choice and true/false questions. This formatting allows for clear and immediate computer-assisted feedback which has also been shown to be effective for asynchronous courses (Corbett & Anderson, 2001).

New reference slides are another project deliverable. Reference slides were created for each of the ten lessons whose slide decks cited studies, reports, webpages, or images. These slides are found at the end of each lesson and are formatted using APA Style guidelines with hyperlinks clickable to the original sources.

Revision Process

Each module went through an iterative review process with the original course designers, who are WASH in HCF experts. Feedback was provided during meetings and via email. This author updated the modules based on feedback then returned finalized versions to the original course designers for final review.

Ethical Considerations

This special studies thesis was not original research, and no human subjects were involved. Therefore, no IRB approval was required.

Chapter 4: Results

Overview

The content for the online, asynchronous course *WASH in Healthcare Facilities 101: Introductory Short Course* is laid out in four modules:

1. **Introduction to WASH in Healthcare Facilities**
2. **Health System Strengthening and Linkages to the Health System**
3. **Determining the Status of WASH in Healthcare Facilities**
4. **Lessons Learned: WASH in Healthcare Facilities Experiences from Low-Resource Settings**

Within each module are two to four lessons that focus on a specific learning objective. The literature review showed that catching the attention of the learner is an important element for engaging online learners, therefore each lesson begins with a quotation from a WASH in HCF leader, a crucial data point that describes a WASH in HCF issue, or a significant example from WASH in HCF programming (example provided in Figure 1).

Each lesson is structured to first introduce the learning objective, then to deliver and reflect upon the learning material, and finally to conclude with a lesson summary that reiterates key messages related to the learning objective. Salient features that apply to all lessons are further provided in Appendix A.

Figure 1. Example of a slide at the beginning of a lesson designed to catch the learner's attention using a quote.

Module 1: Introduction to WASH in Healthcare Facilities

Module 1 consists of 57 slides that cover four lessons. This module aims to define WASH in HCF, explore global data and global action surrounding WASH in HCF, and explain how the issue relates to health outcomes.

Lesson 1.1: Define WASH in healthcare facilities.

This lesson defines the five components of WASH in HCF and lists examples of activities in HCF that require adequate WASH services. No major changes from the original course were required for the content in this lesson. Minor changes included adding short descriptions to images of WASH in HCF components. For example, Figure 2 shows the slide defining sanitation from the original course compared to the corresponding slide from the new course. The text was added to the new slide because while there will be a recorded narration accompanying slides, there will not be the opportunity for course participants to have a conversation with course facilitators or ask questions in real time. The added text will be a helpful reminder when participants review the course slides. Additional work on this lesson included inserting an introductory quotation, formatting, and creating a lesson summary slide.

Figure 2. Original course slide (left) defining the sanitation component of WASH in HCF compared to updated course slide (right).

Lesson 1.2: Summarize the available global data on the status of WASH in healthcare facilities and understand gaps in your own country.

Lesson 1.2 provides details on the recent history of global WASH in HCF data monitoring. A major change for this lesson was adding a demonstration and activity for learners to utilize the WHO/UNICEF Joint Monitoring Programme's dashboard. The JMP dashboard is a data visualization tool where users can view maps and create charts that demonstrate WASH in HCF service levels (basic service, limited service, no service) in different countries and for different types of facilities (urban vs. rural, hospital vs. non-hospital, etc.) (WHO/UNICEF JMP, n.d.) . The dashboard is a critical tool when becoming familiar with a country's WASH in HCF status. Providing a JMP dashboard demonstration and activity ensures that learners become familiar with JMP as a global data source and can use the dashboard on their own. The activity keeps learners engaged, and also aligns with Knowles' fifth principle of andragogy "orientation to learning," which highlights that adults want to learn things they can apply directly to their work (Knowles et al., 2005). This activity provides learners with the skills to be able to find details on WASH in HCF specific to the countries where they work.

Figure 4. Select excerpts from Lesson 1.2 activity

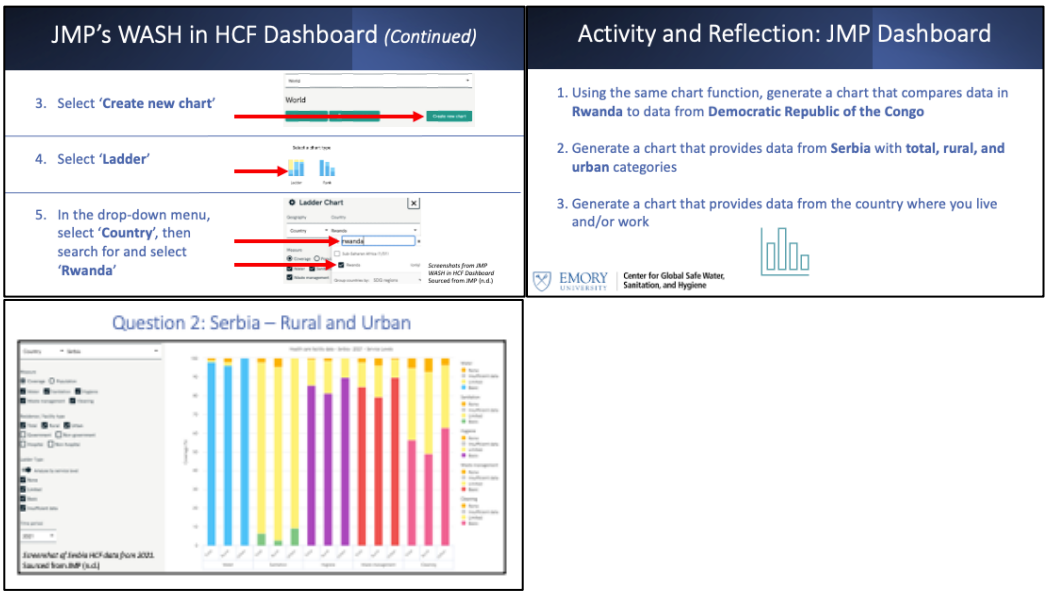


Figure 3. Select excerpts from Lesson 1.2 activity. The upper left slide shows an excerpt of the instructions to create a chart, the top upper right slide consists of activity questions for learners to work through on their own, and the bottom left slide is the chart learners should generate for question two.

Lesson 1.3: Describe and understand the evidence linking WASH in healthcare facilities and health outcomes.

This lesson introduces and explains evidence that inadequate WASH services are associated with poor health outcomes in mothers and newborns, and that provision of WASH services can improve health outcomes for HCF patients. The reformatting of this lesson included creating a table with research linking WASH in HCF conditions to health outcomes. In the original course, studies were listed and explained but were not presented in a table. The table provides an organized summary of the studies that arranges the information for learners to easily be able to see key points. Sources for the studies were cited in a column of the table, and full references were listed on the reference slides at the end of the lesson. Figure 4 shows the reference slides for Lesson 1.3. Reference slides for all other lessons follow the same formatting. Other additions to this lesson included inserting an introductory quotation, updating graphics, formatting, and creating a lesson summary slide.

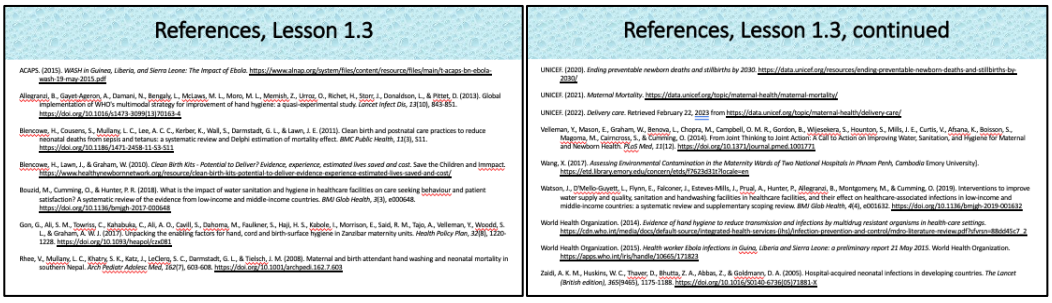


Figure 4. Lesson 1.3 reference slides

Lesson 1.4: Describe the global efforts to accelerate progress on WASH in HCF

This lesson summarizes the growing global movement to address WASH in HCF catalyzed by the United Nations Secretary-General's call to action in 2018. No major changes were necessary to the content within the lesson. Some of the slides in the original course that were text-heavy were adapted to be more engaging in the new course. At the end of the lesson,

five evaluation questions were added. While the original, synchronous course had homework assignments, this format does not work for the new, asynchronous course. According to the literature review, providing evaluation questions and activities in each module allows for assessment and self-reflection that are crucial to the effectiveness of an online course. These evaluation questions, excerpted in Figure 5, replace the original course's homework assignments as a form of assessment. Evaluation questions were designed to either be true/false or multiple-choice questions, so they can be automatically graded by a computer rather than by course facilitators. Other additions to this lesson included inserting an introductory quotation, formatting, updating graphics and references, and creating a lesson summary slide.

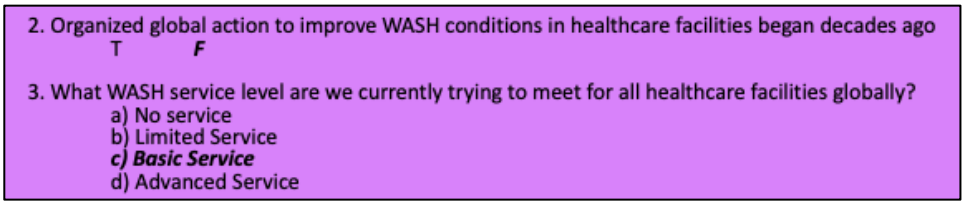


Figure 5. Excerpt of Module 1 evaluation questions.

Module 2: Health System Strengthening and Linkages to the Health System

Module 2 consists of 53 slides that cover three lessons. This module aims to introduce health systems strengthening, to link WASH in HCF to health systems strengthening and major health initiatives, and to define leadership for WASH in HCF services.

Lesson 2.1: Describe the rationale and vital components for a health system strengthening approach that supports a sustainable WASH in HCF program.

This lesson describes how core building blocks of health systems interconnect to improve health outcomes, as well as explains the importance of primary health care in health systems strengthening. One major change in this lesson was the removal of explanations of and references to UNICEF's health systems strengthening approach. While the original course was primarily delivered to UNICEF program officers, the new course will have a wider network of

participants. The original course provided both UNICEF and WHO frameworks on health systems strengthening, but to improve clarity only the WHO framework was kept for the new course. Another major change is that the original course did not explore the importance of primary health care. This lesson in the new course explains that primary health care's emphasis on basic and preventive care is a facilitator for health systems strengthening. Lesson 2.1 also links primary health care to WASH in HCF through the role WASH infrastructure plays in providing services for effective care (Figure 6). Other work on this lesson included inserting an introductory quotation, creating a lesson overview graphic, adding two true/false assessment questions at the end of the lesson, formatting, updating references, and a lesson summary slide.

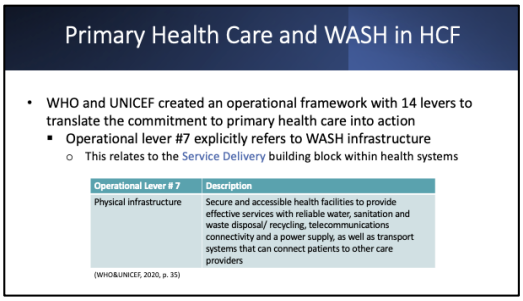


Figure 6. An example of content added to explain that primary health care is a way to advance health systems strengthening. This slide explains the relationship between WASH in HCF and primary health care.

Lesson 2.2: Understand the relationship between WASH and major health initiatives, including Quality of Care, Infection Prevention and Control, and Antimicrobial Resistance.

This lesson defines three major health initiatives, explains how they relate to WASH in HCF, and describes how the initiatives impact health outcomes. One major change to this lesson was the addition of a slide that explains that antimicrobial resistance is just one of many emerging public health threats that relate to WASH in HCF. This addition adds context for learners because it widens the lesson to include many topic areas that participants may encounter in their roles. This change relates to the principles of andragogy explored in the literature review; meaning, adult learners are motivated to learn skills they can apply to their professional work.

The session on major health initiatives in the original course incorporated information from a case study on a quality of care improvement program in Ethiopia that learners were asked to read prior to the synchronous course meeting. Since the new course will not assign homework such as readings, this lesson incorporated slides that introduce and outline the key components of the case study. Other changes to this lesson included inserting an introductory quotation, updating graphics and references, adding a reflection question, and creating a lesson summary slide.

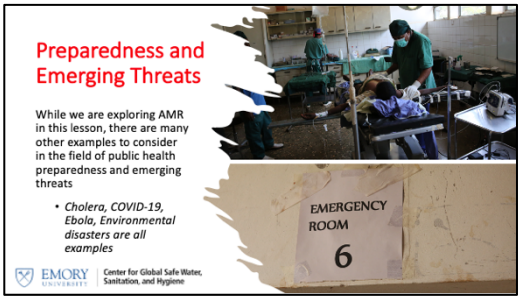


Figure 7. This slide was added so learners could consider which health initiatives for emerging threats are applicable in the context of their countries and places of work.

Lesson 2.3: Understand the leadership of the health sector in delivering WASH in HCF services and the need for partnership with WASH expertise.

This lesson explains that while WASH in HCF is at the junction of two sectors, the health sector and the WASH sector, it is important for the health sector to take the lead due to healthcare facilities being part of the health system. There were no major changes necessary for this lesson. A lesson summary slide (Figure 8) was added to reiterate key points of the lesson. Lesson summary slides for all other lessons follow the same formatting. Since this lesson is the final one of the module, multiple choice and true/false assessment questions were created for conclusion of the lesson to ensure learners internalize the module's learning objectives.

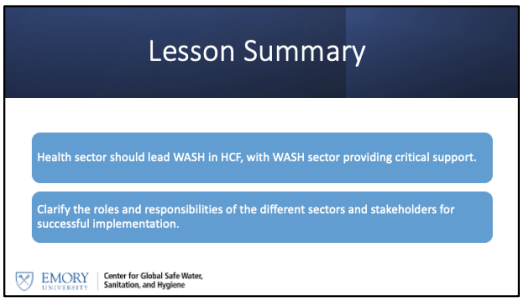


Figure 8: This lesson summary slide reiterates two key points from Lesson 2.3, consistent with the literature review's guidance to provide a conclusion when structuring lectures that apply principles of andragogy.

Module 3: Determining the Status of WASH in Healthcare Facilities

Module 3 consists of 41 slides that cover three lessons. This module aims to develop skills for learners to conduct WASH in HCF situation analyses and assessments.

Lesson 3.1: Be familiar with the existing sources of data for WASH in HCF

This lesson reviews JMP data from Module 1 and introduces other ways to access data related to WASH in HCF, including healthcare facility surveys. One major change in this module was updating the additional sources of data to include the Harmonized Health Facility Assessment (HHFA). HHFA was not yet developed when the original course was designed, so it was not included in the original sessions. Introducing the HHFA is important in the new course because the assessment includes many questions about WASH conditions and will be a helpful resource in gathering data on WASH in HCF service provision moving forward. Otherwise, the remainder of the lesson includes information from the original course such as why looking beyond JMP data to other sources is often required and how to search for those sources. Other changes to this lesson included inserting an introductory quotation, adding images to make the content more engaging, formatting, and creating a lesson summary slide.

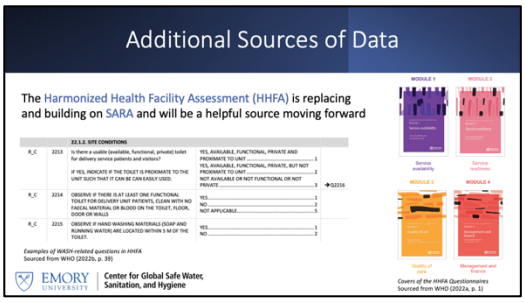


Figure 9. This slide introduces the HHFA and provides examples of HHFA survey questions that address WASH in HCF.

Lesson 3.2: Learn the basics of conducting a situation analysis for WASH in HCF

This lesson explains the components of a situation analysis and provides examples of WASH in HCF situation analyses. One major change to this lesson was the addition of a methodology slide (Figure 9) that lists major characteristics of a situation analysis process: the situation analysis mainly being a desk study, the inclusion of key informant interviews, and a review of findings that culminates in identifying gaps. This slide will help learners to distinguish the WASH in HCF situation analysis from other reports and analyses they have previously conducted. There was also an activity added at the end of the lesson that asks learners to apply concepts from the lesson by searching for a WASH in HCF situation analysis in the country where they live or work. Then learners are asked to reflect upon whether the situation analysis includes the components emphasized in the lesson, such as a climate risk profile.

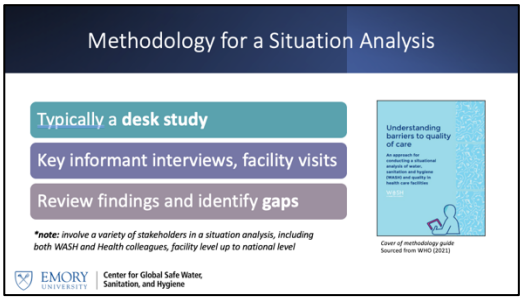


Figure 9. Lesson 3.2 situation analysis methodology slide added in new course.

Lesson 3.3: Be familiar with the various tools available for assessment of WASH services in healthcare facilities.

This lesson covers tools to use for assessments as well as key considerations when designing an assessment, analyzing data, and translating the results to action. One major change to this lesson was the addition of two slides explaining the tool WASH FIT (Figure 10). WASH FIT is a comprehensive framework for WASH in HCF improvement that includes guidelines for baseline assessments. The original course introduced WASH FIT, along with other tools, in its session on assessments, but did not go into detail about the methodology of WASH FIT. When this author met with original course designers, it became clear that most countries have moved to using WASH FIT because it is effective, applicable, and adaptable to many different contexts. The decision was made to add content on WASH FIT because it is likely to be used in the future by many of the course participants. Other changes to this lesson included inserting an introductory quotation, adding images and graphics, formatting, and creating a lesson summary slide.

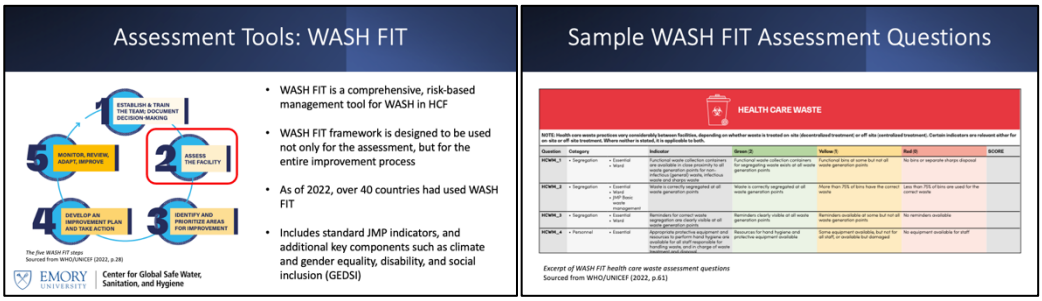


Figure 10. Slides added to go deeper into the methodology of WASH FIT. The slide on the left gives an overview of the tool while the slide on the right provides an excerpt of WASH FIT assessment questions.

Module 4: Lessons Learned: WASH in Healthcare Facilities Experiences from Low-Resource Settings

Module 4 consists of 33 slides that cover two lessons. This module aims to describe action steps for improving WASH in HCF as well as explain common challenges and lessons learned from prior experiences implementing WASH in HCF programs.

Lesson 4.1: Describe the Eight Practical Steps recommended for WASH in HCF

The eight practical steps were created following the 2019 World Health Assembly resolution calling on Member States and partners to act at national, subnational, and facility levels to improve WASH in HCF. The steps provide actionable guidance for countires to reach the 2030 target of 100% basic WASH in HCF coverage. Changes to this lesson from the original course include adding pictures and reducing text to make the slides more engaging. For example, Figure 11 shows the original slides for step 5, monitoring, compared to the corresponding slide in the new course. Other work on this lesson included inserting an introductory quotation, updating graphics and references, formatting, and creating a lesson summary slide.

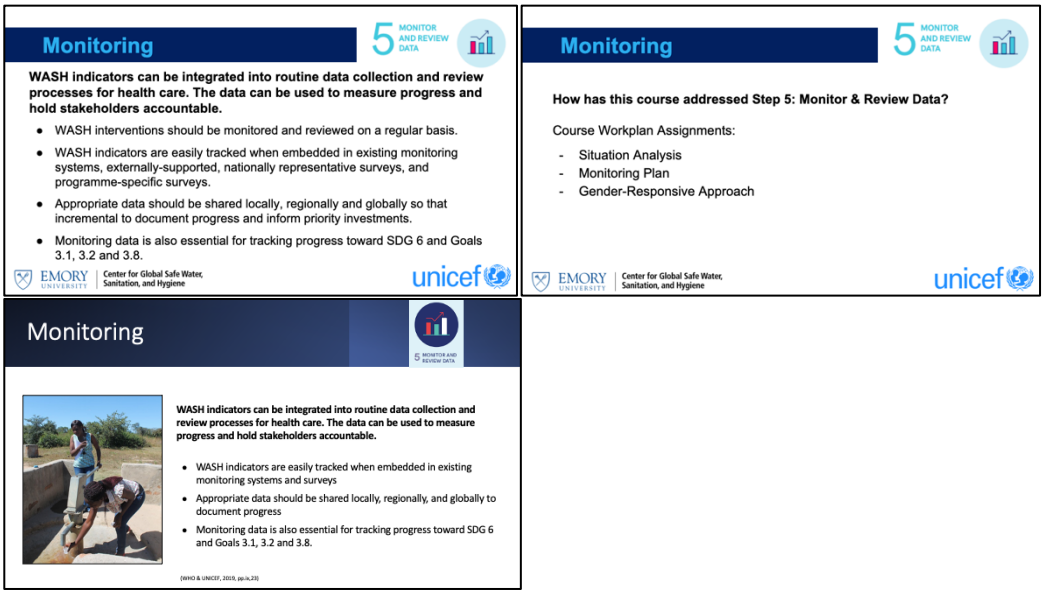


Figure 11. Step 5 (Monitoring) slides in the original course compared to the new course. The two slides on top are the original course content for Step 5, while the one slide on the bottom is from the new course. Content was reduced to fit on one slide and a picture was provided to help make the slide more engaging.

Lesson 4.2: Be familiar with common challenges faced by WASH implementation

This lesson walks through a realistic scenario in which a small clinic faces a series of challenges in assessing and implementing WASH in HCF services. Then, common challenges and suggestions for solutions are discussed. All content was newly created for this lesson.

Original course designers provided this author with an outline of the scenario and guidance for which topics to explain when describing common challenges and solutions. With this information, a series of slides were created to illustrate the scenario, provide a reflection for learners, and then explain seven common challenges in detail.

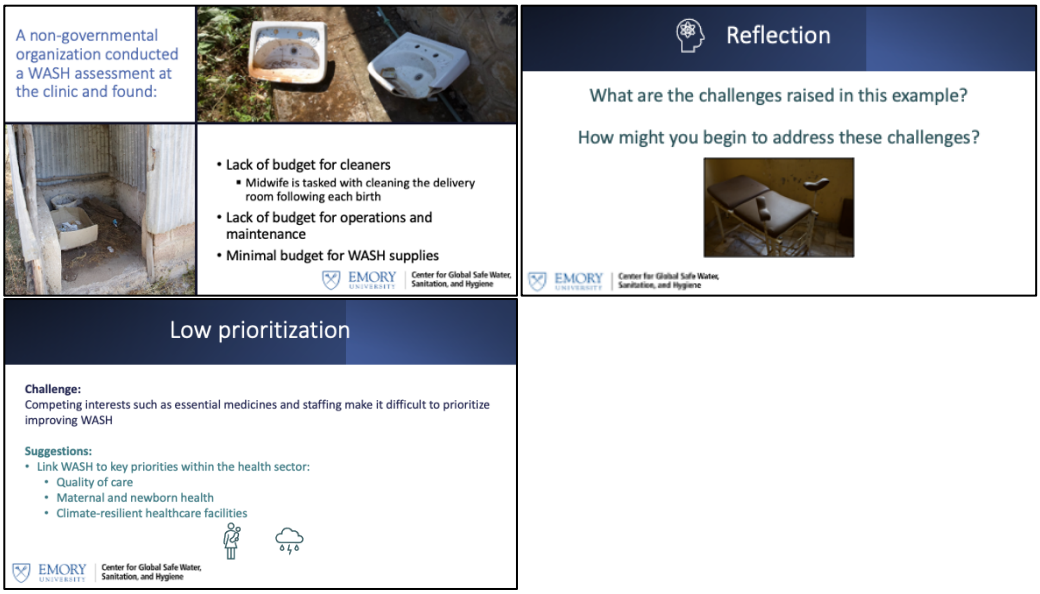


Figure 12. Excerpts from Lesson 4.2. The upper left slide shows part of the scenario created for this lesson, the upper right slide shows reflection questions, and the bottom slides shows one of the seven common challenges detailed in the lesson.

Conclusion

The content for the new asynchronous WASH in HCF short course is provided in four modules consisting of 12 total lessons. Content for each lesson is specific to the lesson's learning objective. However, each lesson incorporates strategies examined in the literature review to ensure that the content is engaging and relevant for learners from the target audience. While some of the new course content was adapted from the original synchronous course other content was newly created (e.g., activities and reflection questions, and the entirety of Lesson 4.2).

Chapter 5: Discussion

This special studies thesis required transforming a synchronous online WASH in HCF course with 11 sessions to an asynchronous format consisting of four modules (or sessions). This process included examining best practices for asynchronous adult education, reviewing original course content, meeting with original course designers, and ultimately designing four modules encompassing 12 learning objectives. Throughout the project, the author became familiar with two different topic areas: asynchronous course design and WASH in HCF. Lessons learned in both areas included how to apply adult learning principles in an online asynchronous course, as well as the need to address accountability and reach in the field of WASH in HCF.

Application of Knowles' adult learning principles

The literature review informed the use of Malcolm Knowles' six principles of andragogy in the course: the learner's need to know, self-concept of the learner, prior experience of the learner, readiness to learn, orientation to learning, and motivation to learn (Knowles et al., 2005). At first, it seemed unfeasible to apply all six principles within the WASH in HCF course because some of the principles appeared to rely on instructors adapting lessons to fit the experiences and goals of individual learners. However, in practice, it became clear that addressing all principles was possible.

1. *The learner's need to know*. This principle indicates that adult learners need to know why they need to learn something to value the learning experience. The introductory module of the new WASH in HCF course explains how while there are many activities in HCF that require basic WASH services; for example, there are 3.85 billion people globally who are served by HCF lacking basic hygiene services (WHO/UNICEF JMP, 2022). Module 1 also explains the newness of the global movement to improve WASH in HCF and how countries and partners can act to join

the movement. This module provides reasoning for why learners should learn skills to implement programming to help solve the global WASH in HCF crisis.

2. *Self-concept of the learner.* This principle emphasizes autonomy and self-directed learning. This principle at first seemed more challenging to achieve due to the nature of asynchronous courses being pre-recorded and lacking in flexibility. However, in each module, reflection questions and/or activities were added to the lessons. These questions and activities prompt learners to pause recordings and apply skills from the course in order to learn more about WASH in HCF with regard to their respective countries and contexts. This achieves a certain level of self-directed learning because learners will adapt and grow skills introduced in the course to meet the needs of their work environments.
3. *Prior experience of the learner*. This principle explains that adult learners come with a broad range of experiences they draw from while learning. The new WASH in HCF short course addresses this principle through the provision of case studies in Module 2 and Module 3, and a thought experiment in Module 4. These case studies allow learners to reflect on their own experiences and how they can apply their experience as well as new concepts learned in the course to situations presented within the case studies.
4. *Readiness to learn*. This principle highlights that adults become prepared to learn when they see an immediate application to their lives and work. Just as case studies address the third principle *prior experience,* they also help to address *readiness to learn.* Case studies provide real-world examples, and there is likely to be crossover between problems learners have run into in the past, and problems that are seen in case studies. By examining solutions that have been used in other contexts, learners can make connections between case studies and scenarios they encounter in their own work.
5. *Orientation to learning.* This principle explains that adult learners want to focus on skills they can use to solve problems that arise in their work. The new WASH in HCF course fulfills this principle by introducing resources that have been designed specifically to address WASH in HCF

problems. For example, Module 3 includes information and guidance on existing tools, such as WASH FIT, that can be implemented to support facilities that lack basic WASH services.

6. *Motivation to learn*. This principle emphasizes that adult learners are motivated by internal factors such as career satisfaction and self-esteem. By providing knowledge and skills to implement WASH in HCF programs, this course can boost learners' confidence and motivation in their careers to take action that addresses WASH in HCF.

All six of Knowles' principles of andragogy were embedded in the new course through the inclusion of activities, reflection questions, case studies, and skills that can be directly applied to problems learners confront in their work. Some of the principles were more easily incorporated than others. The first, third, fourth, and fifth principles were more innately woven in due to the course's emphasis on building skills to resolve the global WASH in HCF issue. The second and sixth principles were more challenging to incorporate because a pre-recorded asynchronous course cannot be continually adapted to fit the characteristics of individual learners. In the future, course facilitators could consider assessing learners' impressions of the course and further adapting it to meet the needs of the target audience.

Accountability and reach in WASH in HCF

Through background research, examining past course materials, and discussions with original course designers, it became clear that accountability and reach are among the major barriers to achieving the vision for every healthcare facility globally to have basic WASH services. WHO, UNICEF, JMP, and other groups have numerous resources that define the WASH in HCF challenges and provide evidence-based guidance to address the issues. However, given the nature of WASH in HCF as being associated with both the Health and WASH sectors, it is challenging to see progress because there tends to be a lack of accountability and leadership. Without leadership and defined roles, it is impossible to use and adapt the existing resources to

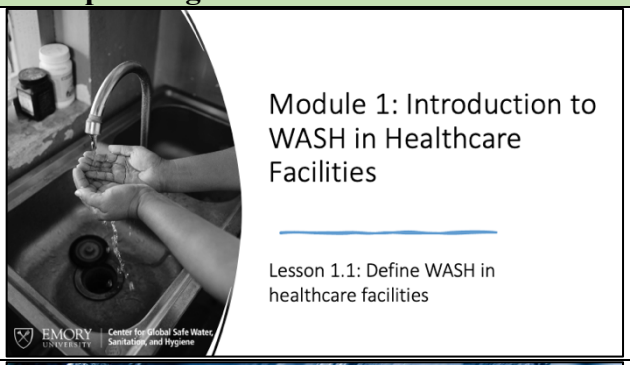
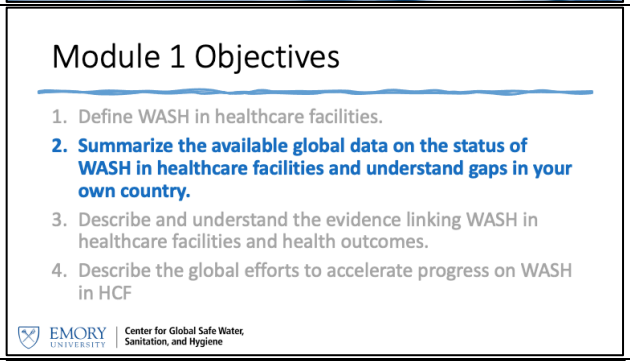
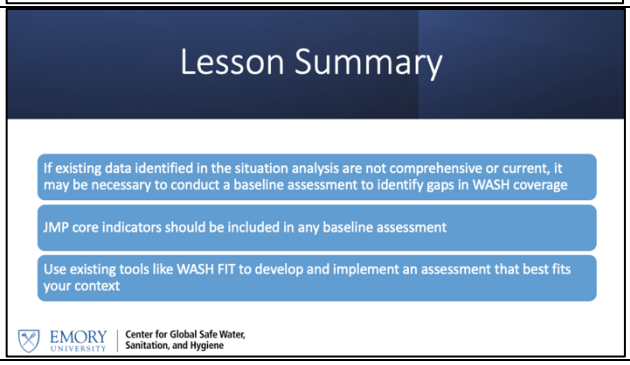
solve WASH in HCF issues. This course addresses accountability by emphasizing leadership and collaboration in Modules 2, 3, and 4. By providing this message repeatedly as an overarching theme, the course aims for practitioners in the field of WASH in HCF to recognize its importance and advocate for accountability and defined leadership within their work contexts.

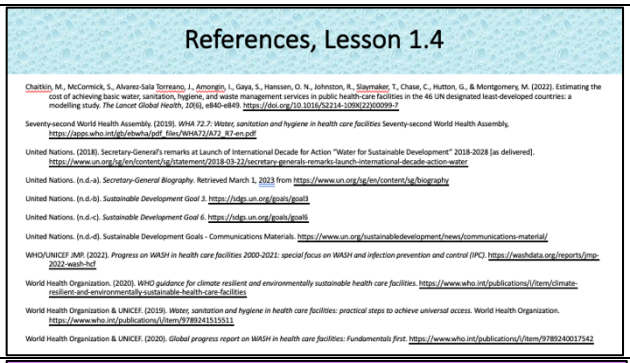
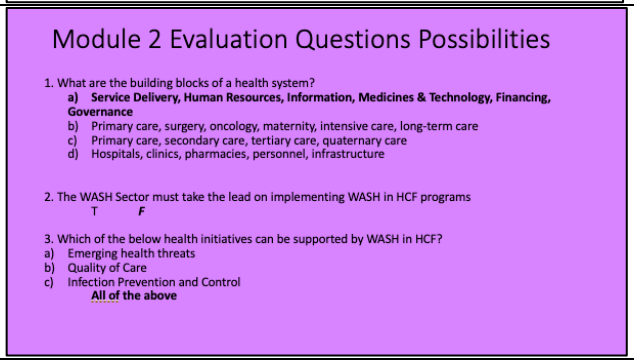
Reach and limited awareness have also been major barriers to improving WASH in HCF conditions. The dire global status of WASH in HCF was first elevated in 2015, and it was not until 2019 that guidance on action steps for countries came in the form of the Eight Practical Steps to improve and sustain WASH in HCF (World Health Organization & UNICEF, 2019). Despite this recent momentum, many key stakeholders are still unaware of the extent of the issue. This course combats this lack of awareness by providing information on the history of WASH in HCF and skills to address the issue. The new course also aims to increase reach through its asynchronous formatting. Practitioners and other key stakeholders lead busy careers and have many responsibilities that may preclude them for participating in synchronous courses. Furthermore, as WASH in HCF is a global issue, there are stakeholders in every time zone which may further limit the effectiveness of synchronous sessions. The transformation of this course to an asynchronous format allows learners to move through the modules at their own pace and intervals and at times that are amenable to their schedules and time zones.

Conclusion

WASH in Healthcare Facilities 101: Introductory Short Course fulfills the need for an updated WASH in HCF course that is accessible to a wider network of practitioners and that provides manageable learning modules. The course was designed with careful attention to the specific needs of adult learners, and with emphasis on raising awareness and motivation for action on WASH in HCF.

Annex A: Salient features created for *WASH in Healthcare Facilities 101: Introductory Short Course* that apply to all modules and lessons.

Type of slide	Example image of slide	Purpose of slide
Title slide		Introduce each module and lesson
Quotation slide		Quotations or statistics at the beginning of each lesson to catch learners' attention.
Objective slide		Show the current lesson's objective as well as its overall context within the module. The current lesson is bolded in blue.
Lesson summary slide		Reiterate key points at the end of each lesson.

Reference slide		Cite all sources and provide clickable links following each lesson.
Evaluation question slide		Provide potential evaluation questions at the end of each module for course facilitators to consider incorporating to assess learners.

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