Centro de Apoyo a la Innovación Docente y Estudios Online-IDEO
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ANEXO I
A LA CONVOCATORIA DE CREACIÓN DE GRUPOS DE INNOVACIÓN DOCENTE 2023

Propuesta de creación de Grupo de Innovación Docente

Ficha técnica del GID

1. **Grupo de Innovación Docente de Excelencia** (Marque la casilla que proceda)
SÍ x NO ☐

2. **Denominación del GID (y acrónimo si lo tiene)**

Responding to chemical, biological, radiation and nuclear incidents - CBRN*training*

3. **Coordinador / coordinadores**

(Se debe indicar el cumplimiento de los requisitos para ser coordinador, y en caso de ser dos se debe justificar adecuadamente)

Dr. Antonio Peña Fernández

Academic positions:

- ✓ Assistant Professor in Legal Medicine & Forensic Toxicology, Department of Surgery, Medical and Social Sciences, Faculty of Medicine and Health Sciences, University of Alcalá, Alcalá de Henares, Madrid, Spain. Since 1st September 2023.
- ✓ Associate Professor in Toxicology & Medical Sciences, De Montfort University, Leicester, UK; from 2nd March 2015 to 31st August 2023.

Teaching accreditation:

- ✓ Senior Fellow of the Higher Education Academy (SFHEA). November 2016. Recognition reference: PR116991.
- ✓ DOCENTIA programme: not applicable (started at UAH in September 2023).

Merits in the last three years

Teaching awards:

- ✓ Teacher Fellowship. De Montfort University, 2020.
- ✓ Research-Engaged Teaching. De Montfort University, 2020.

Teaching Committees:

- ✓ Member of review panel for Advance Higher Education (HE) STEM Conference 2020 and 2021.
- ✓ Co-Chair DMU NTF-TF-CATE Committee.

- ✓ DMU HEA Professional Recognition Scheme (SFHEA) panel member.
- ✓ DMU Learning & Teaching Conference 2023-24 (Faculty representative).

Other merits:

- ✓ Co-applicant of five Teaching Innovation Projects (two of them at UAH).
- ✓ Four publications related to teaching innovation, three of them in indexed journals.
- ✓ Thirteen book chapters related to teaching innovation.
- ✓ Twenty-two teaching innovation communications published as proceeding papers.
- ✓ Presenter at different international teaching innovation congresses.
- ✓ Nine presentations as oral and poster presentations at EIDU since 2020.

4. Líneas de innovación

(El GID podrá elegir la/s línea/s en las que enfocará su actuación, que podrá coincidir o no con las líneas de interés de la presente convocatoria. Seleccione la/s que proceda/n)

☐ Línea 1: Aprendizaje basado en retos
X Línea 2: Clase invertida o flipped classroom
☐ Línea 3: Aprendizaje Servicio (*ApS*)
X Línea 4: Gamificación, aprendizaje basado en Juegos y experiencias lúdicas
X Línea 5: Herramientas para la mejora de la calidad de la docencia
X Línea 6: Competencias, creación de valor y Objetivos de Desarrollo Sostenible
X Otra (redáctela de manera concisa): Desarrollo curricular

- ✓ **Relación de miembros y descripción individual de sus méritos**

(Se describirán los méritos de cada miembro en innovación docente para la categorización del grupo, si procede, como "Grupo de Innovación Docente de Excelencia", según el formato del Anexo IV).

Prof. Jorge Pérez Serrano
Catedrático de Universidad en Parasitología. Dpto. de Biomedicina y Biotecnología.
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA – Año 2019. Favorable.
- Miembro del GID: (UAH-GI20-135) Aprendizaje servicio (*ApS*) como metodología de innovación docente en las Áreas de Microbiología y Parasitología.
- Participación en proyectos de innovación.
1. Implementación de la docencia de Parasitología en la Facultad de Farmacia en el marco de EEES: elaboración de nuevos materiales didácticos. IP. 2011
2. Implementación de la docencia de Parasitología en la Facultad de Farmacia en el marco de EEES: elaboración de nuevos materiales didácticos. IP. 2010
- Participación en el EIDU. VII Encuentro de Innovación en Docencia: Los agentes del cambio en la universidad: Luces y sombras de la participación.
- Participación en otros congresos de innovación docente.
1. Ponente y Organizador del Seminario de Tutoría Universitaria de la Universidad de Alcalá. Julio 2003
2. Ponente y Organizador de "El programa de tutorías académicas personalizadas de la Universidad de Alcalá de Henares" del Congreso Tutorías y créditos ECTS: claves para el cambio. 2004
3. Ponente y Organizador del seminario "Los planes de acción tutorial en la UAH: desarrollo de un proyecto conjunto de la Universidad de Alcalá. 2004".
- Otras actividades de innovación docente. 1. Universidad de Alcalá. "Implementación de la docencia de Parasitología en la Facultad de Farmacia en el marco de la EEES: elaboración y edición de un atlas

parasitológico fotográfico". Jorge Pérez Serrano; Filomena Rodríguez Caabeiro; Andres Matías López; Cristina Verdú Expósito, 2014. Capítulo 14: 483- 492. ISBN: 978-84-15834-56-4.

Dr. Guillermo Torrado Durán
Profesor Titular de Farmacia y Tecnología Farmacéutica. Dpto. Ciencias Biomédicas.
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA – Año 2022. Muy Favorable.
- Miembro del GID: (UAH-GI21-173) Estrategias de evaluación de competencias en prácticas tuteladas (Grado de Farmacia).
- Diferentes comunicaciones relacionadas con innovación docente:
  - ✓ Peña-Fernández A., Koroma S., Acosta L., **Torrado G.,** Peña MA. Capacity building using an open-access e-Parasitology phone app. ICERI2021 Proceedings; pp. 9088-9091. ISBN: 978-84-09-34549-6.
  - ✓ Peña-Fernández A., Peña MA., Smith S., Evans M.D., **Torrado G.**, Breda C., Randles M.J. Introduction of e-Biology at two English universities to strengthen self-learning of 'clinical skills'. ICERI2021 Proceedings; pp. 9104-9109. ISBN: 978-84-09-34549-6.
  - ✓ Peña-Fernández A., Morchón R., **Torrado G.**, Evans M.D., Peña MA. Experience of undergraduate and postgraduate students with an educational game app for smartphones for learning diagnosis of malaria. EduLearn Proceedings 2022; pp. 5741-5745. ISBN: 978-84-09-42484-9.
  - ✓ Peña-Fernández A., Peña MA., **Torrado G.**, Acosta L. Results of and evaluation of a novel smartphone app for learning medical parasitology. EduLearn Proceedings 2022; pp. 5778-5782. ISBN: 978-84-09-42484-9.
  - ✓ Peña-Fernández A., Peña MA., **Torrado G.**, Guetiya Wadoum RE. Experience from the field in Sierra Leone on capacity building of medical parasitology. INTED2023 Proceedings; pp. 7082-7087. ISBN: 978-84-09-49026-4.
  - ✓ Peña-Fernández A., **Torrado G.**, Evans M.D., Peña MA. Training to respond to pharmaceuticals and personal care products in the food chain. INTED2023 Proceedings; pp. 7088-7092. ISBN: 978-84-09-49026-4.
  - ✓ Participación en el EIDU con la comunicación: Peña MA., **Torrado G.**, Peña-Fernández A. Learning strategies from individual needs and capacities in the training process of Pharmacy students. XII Teaching Innovation Meeting in Higher Education (XII EIDU), 14th to 15th October 2020, Alcalá de Henares, Spain.

Dr. Víctor Guarnizo Herrero
Profesor Ayudante Doctor de Farmacia y Tecnología Farmacéutica. Dpto. Ciencias Biomédicas.
- Programa DOCENTIA no aplicable (contratado desde junio del 2023).
- Participación en 1 proyectos de innovación:
Título: "Creación de un nuevo recurso educativo virtual para estudiantes de grado en farmacia".
Entidad Financiadora: Univ. Complutense. Proyecto de Innovación y Mejora de la Calidad Docente número 170. Convocatoria Curso Académico 2017/2018.
Vinculación: Participación como Miembro del proyecto de innovación docente desde el 01/09/2017.
Investigador Principal: Dª. Susana Torrado Durán.
- Diferentes publicaciones relacionadas con innovación docente, en forma de capítulos de libro:
  - ✓ Título: "Empleo de las tecnologías de la Información y Comunicación para el desarrollo de habilidades profesionalizantes en los estudiantes universitarios" Monográfico: "Educar para transformar: Innovación pedagógica, calidad y tic en contextos formativos". ISBN:978-84-1122-469-7.
  - ✓ Título: "Estudio comparativo de distintas aplicaciones móviles para mejorar la adherencia al tratamiento en pacientes polimedicados" Monográfico: "Educación y sociedad: pensamiento e innovación para la transformación social". ISBN: 978-84-1122-468-0.

- ✓ Título: "comparación entre el sistema de aprendizaje flipped classroom y tradicional classroom e influencia en la mejora del aprendizaje en estudios universitarios de ciencias de la salud " Monográfico: " Innovación Docente e Investigación en Salud: Experiencias de cambio en la Metodología Docente ". ISBN: 978-84-1122-866-4.
- ✓ Título: "estudio comparativo de nuevos sistemas de autoaprendizaje en equipo, podcast, sistemas basados en resolución de casos y problemas Monográfico: " Innovación Docente e Investigación en Salud: Experiencias de cambio en la Metodología Docente ". ISBN: 978-84-1122-866-4.

- Diferentes comunicaciones relacionadas con innovación docente en forma de pósters:
  - ✓ Título: "Estudio comparativo de distintas aplicaciones móviles para mejorar la adherencia al tratamiento en pacientes polimedicados ". Tipo de participación: Póster. Autores: Víctor Guarnizo Herrero, Carlos Torrado Salmerón y Santiago Torrado Durán. Congreso: VI Congreso Internacional sobre Innovación Pedagógica y Praxis Educativa (INNOVAGOGIA 2022). Lugar de celebración: Sevilla, España. Fecha: 25-27/05/2022. Carácter: Internacional.
  - ✓ Título: "Desarrollo de un entorno virtual que permita al alumno adquirir habilidades en el manejo de las Tecnologías de la Información y Comunicación". Tipo de participación: Póster. Autores: Carlos Torrado Salmerón, Víctor Guarnizo Herrero y Santiago Torrado Durán. Congreso: VI Congreso Internacional sobre Innovación Pedagógica y Praxis Educativa (INNOVAGOGIA 2022). Lugar de celebración: Sevilla, España. Fecha: 25-27/05/2022. Carácter: Internacional.
  - ✓ Título: "influencia del control de tiempo en las mejoras de los nuevos sistemas de aprendizaje". Tipo de participación: Póster. Autores: Carlos Torrado Salmerón y Víctor Guarnizo Herrero. Congreso: IV Congreso Internacional de Innovación Docente e Investigación en Educación Superior: Retos de la actualización en la enseñanza de las ÁREAS DE CONOCIMIENTO. Lugar de celebración: Madrid, España. Fecha: 07-12/11/2022. Carácter: Internacional.
  - ✓ Título: "influencia de las flipped classroom en la mejora del aprendizaje en estudios universitarios de ciencias de la salud". Tipo de participación: Póster. Autores: Víctor Guarnizo Herrero y Carlos Torrado Salmerón. Congreso: IV Congreso Internacional de Innovación Docente e Investigación en Educación Superior: Retos de la actualización en la enseñanza de las ÁREAS DE CONOCIMIENTO. Lugar de celebración: Madrid, España. Fecha: 07-12/11/2022. Carácter: Internacional

<u>Colaboradores vinculados</u>

Profs. Carmen del Aguila and Soledad Fenoy
Drs. Fernando Izquierdo, Angela Magnet, Carolina Hurtado and María Dolores Ollero.
Facultad de Farmacia, Universidad San Pablo-CEU, CEU Universities, Urbanización Montepríncipe, 28660 Boadilla del Monte, Spain.
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA – todos Excelente
- Participación en diversos proyectos de innovación docente.
- Presenter at the following EIDU event:

Peña-Fernández A., Sgamma T., Evans MD., Llorens S., **Izquierdo F.**, **Hurtado C.,** Martins IR., Peña MA., Acosta L. Virtual biomedical laboratories in times of COVID-19. XII Teaching Innovation Meeting in Higher Education (XII EIDU), 14th to 15th October 2020, Alcalá de Henares, Spain. *Oral presentation*.

Dr. Rodrigo Morchón García
Profesor Titular. Grupo de Dirofilariasis Animal y Humana, Facultad de Farmacia, Campus Miguel Unamuno, Universidad de Salamanca, 37007 Salamanca, Spain.
Grupo de Enfermedades Zoonósicas y Una Sola Salud.

- Evaluación de la actividad docente del profesorado. Programa DOCENTIA de la Unidad de Evaluación de la Calidad (UEC) de la Universidad de Salamanca – Año 2019. Excelente (máxima calificación).
- Participación en 7 proyectos de innovación docente, dos de ellos como Investigador principal.
- 17 publicaciones en innovación docente publicadas en editoriales nacionales e internacionales indexadas.
- Ponente invitado en diferentes congresos nacionales e internacionales relacionados con innovación docente.

Dra. Lucrecia Acosta Soto
Profesora Contratada Doctora, Área de Parasitología, Departamento de Agroquímica y Medio Ambiente, Universidad Miguel Hernández de Elche, Ctra. Valencia Km 8.7, 03550 San Juan, Alicante, Spain.
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA – Años 2018 a 2023. Excelente (máxima calificación).
- Participación en 1 proyecto de innovación docente como Investigador principal.
Premios innovación docente:
  - ✓ Award for Research-Engaged Teaching 2020/2021. De Monfort University, UK.
  - ✓ Leicestershire Live Innovation Awards 2021, Innovation in Education and Training – the Innovation in Education and Training Category: DMU e-Parasitology Project.
  - ✓ Award for Research-Engaged Teaching 2020. Leicester School of Allied Health Sciences. De Monfort University.

- Diferentes publicaciones relacionadas con innovación docente.

Dr. Fernando Bornay LLinares
Profesor Titular, Área de Parasitología, Departamento de Agroquímica y Medio Ambiente, Universidad Miguel Hernández de Elche, Ctra. Valencia Km 8.7, 03550 San Juan, Alicante, Spain.
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA – Años 2016 a 2023. Excelente (máxima calificación). Premios al talento docente años: 2017, 2019 y 2021.
- Diferentes publicaciones relacionadas con innovación docente.
- Premios innovación docente:
  - ✓ Award for Research-Engaged Teaching 2020/2021. De Monfort University, UK.
  - ✓ Leicestershire Live Innovation Awards 2021, Innovation in Education and Training – the Innovation in Education and Training Category: DMU e-Parasitology Project.
  - ✓ Award for Research-Engaged Teaching 2020. Leicester School of Allied Health Sciences. De Monfort University.

Dr. Ana Montoya Matute
Profesora Titular. Dpto de Sanidad Animal. Facultad de Veterinaria. Universidad Complutense de Madrid. 28040 Madrid. Spain.
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA de la Unidad de Evaluación de la Calidad de la UCM – Años 2019-22. Excelente (máxima calificación).
- Participación en 2 proyectos de innovación docente: uno como Investigador principal y otro miembro del equipo.
- Participación en 2 proyectos de innovación docente: uno como Investigador principal y otro miembro del equipo.
- Participación como ponente mediante 4 comunicaciones orales y 1 en formato poster en Congresos de Formación Docente Universitaria.

- Ponente invitado en I y II Congreso Internacional de Innovación Docente e Investigación en Educación Superior: un reto para las áreas de Conocimiento.

Dr. Guillermo Repetto Kuhn
Profesor Titular, Área de Toxicología, Universidad Pablo de Olavide, 41013 Sevilla
- Evaluación de la actividad docente del profesorado. Programa DOCENTIA-UPO– Año 2023. Excelente.
Proyectos Innovación docente: Developing EU training to teach medical preparedness, public health and recovery to protect the public in the aftermath of a biological incident. De Montfort University (Uk). Financia: De Montfort University Teaching Innovation Project Fund 2017. 1-06-2017 a 1-06-2019. Repetto G.

Dra. María Llana Ruiz-Cabello
Profesor Contratado Doctor, Área de Toxicología, Universidad Pablo de Olavide, 41013 Sevilla.
Programa DOCENTIA no aplicable (insuficiente antigüedad).
- *I Jornadas de Toxicología: Seguridad Alimentaria, Drogas de Abuso y Toxicología Molecular.*

Organismo: Universidad de Sevilla. III Plan Propio de Docencia. Apoyo a la Coordinación e Innovación Docente. Convocatoria 2019.
Responsable: Dra. Silvia Pichardo Sánchez.
Participantes: BERMEJO BARRERA AM, CAMEÁN AM, DIEZ-QUIJADA L, GUZMÁN GUILLÉN R, JOS A, LLANA RUÍZ-CABELLO M, MEDRANO PADIAL C, MOYANO SALVAGO R, PRIETO AI, PUERTO M.

Dra. Sara Maisanaba Hernández
Profesora Titular de Universidad, Área de Toxicología, Universidad Pablo de Olavide, 41013 Sevilla.
Programa DOCENTIA no aplicable hasta enero de 2024 (insuficiente antigüedad en el centro adscrito).
- *Developing EU training to teach medical preparedness, public health and recovery to protect the public in the aftermath of a biological incident. De Montfort University (Uk).*

Organismo: De Montfort University Teaching Innovation Project Fund 2017. 1-06-2017 a 1-06-2019. Repetto G.
Responsable: Antonio Peña

Dr. Mark D. Evans
Leicester School of Allied Health Sciences, De Montfort University, Leicester, LE1 9BH, UK.
- Co-applicants of two Teaching Innovation Projects.
- Two publications related to teaching innovation, one of them in indexed journal.
- Co-authors of different book chapters and proceeding papers related to teaching innovation.
- Co-presenters at the following EIDU events:

Peña-Fernández A., Sgamma T., **Evans MD.**, Llorens S., Izquierdo F., Hurtado C., Martins IR., Peña MA., Acosta L. Virtual biomedical laboratories in times of COVID-19. XII Teaching Innovation Meeting in Higher Education (XII EIDU), 14th to 15th October 2020, Alcalá de Henares, Spain. *Oral presentation*.

Peña-Fernández A., Young C., Randles M., Breda C., Potiwat N., Martins IR., Sgamma T., Peña MA., **Evans MD.** e-Biology: un recurso novedoso para aprender biología y bioquímica clínica. XII Teaching Innovation Meeting in Higher Education (XII EIDU), 14th to 15th October 2020, Alcalá de Henares, Spain. *Oral presentation*.

Prof. Raquel Duarte-Davidson
Health Security Agency, Harwell Science and Innovation Park, OX11 0RQ, UK.
Professor & Head of Chemicals and Poisons Department.
Visiting Professor at Cranfield University (College Rd, Cranfield, Wharley End, Bedford MK43 0AL, UK).

- PI of different projects related with CBRN and education.
- Co-author of different publications related with teaching innovation including:

Peña-Fernández A., **Duarte-Davidson R.**, Wyke S., Peña MA. Long-term analysis of a novel course for teaching CBRN preparedness and response. In: Satorre Cuerda, Rosana (ed.). El profesorado, eje fundamental de la transformación de la docencia universitaria. Barcelona: Octaedro, 2022. ISBN 978-8-19506-52-8, pp. 124-133.

Peña-Fernández A., Wyke S., **Duarte-Davidson R.** Recovering environments affected by chemical incidents: The Chemical Recovery Navigation Tool. In: Toxicology for the Health & Pharmaceutical Sciences. Eds. Peña-Fernández A., Cooke M., Evans MD. CRC Press editorial (Taylor & Francis Group LLC). 2021; 487-499. ISBN 978-1-138-30336-2 (hardback). DOI: 10.1201/9780203730584.

Plan de trabajo a desarrollar en tres años (*)

1. Introducción

(En este apartado se debe describir, entre otros, la situación de la innovación perseguida por el grupo, así como el contexto docente actual en el que se enmarca la actuación de este)

Recent global health threats from bioterrorism to the use of chemical substances during the 2011-17 Syrian war (Rodriguez-Llanes et al., 2018) or the current wars in Ukraine and Israel-Gaza, highlight the potential for a significant toxicological disaster (Chai et al., 2022). Attacks involving chemical, biological, radiation or nuclear (CBRN) substances, although rare, can affect large groups of a population and affect multiple countries simultaneously (Duarte-Davidson et al., 2014), and require a coordinated and immediate response from different experts and first and emergency responders to minimise the spread of the substances involved and the impact on human health (Carter et al., 2020). Moreover, an immediate identification of the CBRN substances involved is critical to tackle the incident (Plamboeck et al., 2016). However, the physicochemical and toxicological characteristics of the chemicals used or the physiological behaviour of the biological agents used in unconventional weapons can be unknown; they can be highly persistent in the environment and can threaten the human health until the environment is properly decontaminated as demonstrated by the recent attack in England with the environmentally persistent Novichock agent (Haslam et al., 2022). CBRN substances are used as they can spread quickly in the environment without being easily detected (Williams et al., 2018). Moreover, non-intentional events involving CBRN substances can also challenge healthcare systems, resulting in high morbidity and mortality levels in the absence of appropriate preparedness and resources, as demonstrated by the ongoing coronavirus pandemic (Montrucchio and Brazzi, 2021).

Appropriate education to increase preparation of first and emergency responders is pivotal to reduce casualties, which is of increasing relevance as current scenarios reveal new types of ever increasing dynamic and aggressive CBRN threats. However, teaching preparedness, response and environmental decontamination in the aftermath of a CBRN incident or attack is practically non-existent at Universities in Europe. Thus, literature reviews have shown that insufficient CBRN training is provided in Europe (Olivieri et al., 2017). Different studies have found that only a small number of medical universities provide disaster medicine within their core curriculum, which could be of significant public health concern in view of recent events and threats (Smith et al., 2012; Jain et al., 2022). Moreover, teaching status of emergency CBRN preparedness is also insufficient in other medical related professionals that are a fundamental part of the

first response team, including nurses, paramedics, ambulance and emergency rescue professionals (Berben et al., 2021).

References

Berben, S. A., Vloet, L. C., Lischer, F., Pieters, M., & de Cock, J. (2021). Medical Coordination Rescue Members' and Ambulance Nurses' Perspectives on a New Model for Mass Casualty and Disaster Management and a Novel Terror Attack Mitigation Approach in the Netherlands: A Qualitative Study. Prehospital and disaster medicine, 36(5), 519-525.

Carter, H., Drury, J., & Amlot, R. (2020). Recommendations for improving public engagement with pre-incident information materials for initial response to a chemical, biological, radiological or nuclear (CBRN) incident: A systematic review. International Journal of Disaster Risk Reduction, 51, 101796.

Chai, P. R., Berlyand, Y., Goralnick, E., Goldfine, C. E., VanRooyen, M. J., Hryhorczuk, D., & Erickson, T. B. (2022). Wartime toxicology: the spectre of chemical and radiological warfare in Ukraine. Toxicology communications, 6(1), 51-57.

Duarte-Davidson, R., Orford, R., Wyke, S., Griffiths, M., Amlot, R., & Chilcott, R. (2014). Recent advances to address European Union Health Security from cross border chemical health threats. Environment international, 72, 3-14.

Haslam, J. D., Russell, P., Hill, S., Emmett, S. R., & Blain, P. G. (2022). Chemical, biological, radiological, and nuclear mass casualty medicine: a review of lessons from the Salisbury and Amesbury Novichok nerve agent incidents. British journal of anaesthesia, 128(2), e200-e205.

Jain, N., Prasad, S., Bordeniuc, A., Tanasov, A., Cheuk, C. P., Panag, D. S., ... & Reinis, A. (2022). Covid-19 and Ukrainian crisis exponentiates the need for the inclusion of conflict and disaster medicine in medical curriculum. Journal of medical education and curricular development, 9, 23821205221096347.

Montrucchio, G., & Brazzi, L. (2021). Are we at a turning point for disaster medicine education? The SIAARTI Academy Critical Emergency Medicine course experience. Minerva anestesiologica, 87(11), 1161–1163. https://doi.org/10.23736/S0375-9393.21.16008-0

Olivieri, C., Ingrassia, P. L., Della Corte, F., Carenzo, L., Sapori, J. M., Gabilly, L., ... & Djalali, A. (2017). Hospital preparedness and response in CBRN emergencies: TIER assessment tool. European Journal of Emergency Medicine, 24(5), 366-370.

Plamboeck, A. H., Stöven, S., Davidson, R. D., Fykse, E. M., Griffiths, M., Nieuwenhuizen, M., ... & van der Schans, M. (2016). Laboratory analysis of CBRN-substances: Stakeholder networks as clue to higher CBRN resilience in Europe. TrAC Trends in Analytical Chemistry, 85, 2-9.

Rodriguez-Llanes, J. M., Guha-Sapir, D., Schlüter, B. S., & Hicks, M. H. R. (2018). Epidemiological findings of major chemical attacks in the Syrian war are consistent with civilian targeting: a short report. Conflict and health, 12, 1-6.

Smith, C., & Hewison, A. (2012). Are nurses prepared to respond to a bioterrorist attack: a narrative synthesis. Journal of Advanced Nursing, 68(12), 2597-2609.

Williams, M., Armstrong, L., & Sizemore, D. C. (2018). Biologic, Chemical, and Radiation Terrorism Review. In StatPearls. StatPearls Publishing.

2. Justificación

(De acuerdo con el apartado primero, se debe incluir la motivación para crear el grupo y los argumentos que justifiquen la necesidad de este)

Following the current CBRN threat in Ukraine and in Israel-Gaza and the still on-going devastating effects of the 2019-23 coronavirus pandemic, the establishment of our teaching innovation group at UAH is at the

upmost importance. The proposed group at UAH will work with environmental experts, microbiologists, virologists, parasitologists, veterinarians and HCPC (Health and Care Professions Council, the UK regulatory body that certifies their professions) registered biomedical scientists who have worked as part of the international response against biological incidents (*e.g.* the 2014-16 Ebola outbreak), from England and Spain, to develop all the necessary resources to deliver appropriate and harmonised training to respond to CBRN incidents. This training will cover the major competences identified by the European Commission (EC) to respond to CBRN events (Djalali et al., 2017).

Our teaching group has developed an initial training course that involves the chemical and biological aspects (Peña-Fernandez et al., 2019a, 2019b), which consisted of different short training sessions that target some of the major EC competences indicated in Djalali et al. (2017), as competency-based training has been described as the key element for CBRN preparedness (Bajow et al., 2022). These tailored basic competences are aimed at covering the different phases of a response to a CBRN incident: incident response preparedness and situation assessment; exposure assessment; acute health effects; long-term health effects; and recovery phase (Sandström et al., 2014).

The use of technical advances such as web-based and virtual environments in medical sciences has shown them to be effective in increasing student engagement and provide flexible learning in terms of time and space (Reid et al., 2016). E-learning resources are increasingly relevant resources in higher education to tackle the challenges that human health course in universities are currently facing such as larger student cohorts together with the limited number of academic staff, the delivery of cutting-edge topics and the progressive increase of medical knowledge that requires constant adaptation (Strube et al., 2018). Additionally, the World Health Organisation (WHO) and the United Nations (UN) have suggested e-Learning as a potential innovative, flexible, interactive and adaptive resource that can be used to address the increasing shortage of health professionals (Al-Shorbaji et al., 2015), which it is envisaged to increase to 18 million by 2030 (Law et al., 2018). However, modern technology requires a certain degree of knowledge in the user and presents some difficulties including accessibility problems, support and frequent updates.

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3. Objetivos

(Se deben incluir los objetivos que se persiguen con la actividad innovadora que se pretende desarrollar)

The main aim of our group is developing and implementing effective disaster medicine and CBRN preparedness and response in the curricula of different undergraduate and postgraduate programmes at UAH and at the participating Universities in Spain (Miguel Hernández de Elche, Pablo de Olavide, San Pablo CEU, Salamanca) and in England (De Montfort).

Other objectives include:

- Development of highly interactive on-line teaching and learning resources together with a "virtual laboratory" and games built on apps for Smartphones.
- Creation of specific e-learning units and guidance related to the detection of emerging CBRN substances.
- Development of guidelines and related resources that address the core competences that any medical first responder to CBRN emergencies should have identified recently by the European Commission (Djalali et al., 2017). The resources developed will be harmonised and open-access so they can be used in any educational arena within the European Higher Education Area (EHEA) and globally.
- Comprehensive evaluation of the effectiveness of the virtual and guidelines resources developed in providing appropriate and effective education to cover all the different phases of a response to a CBRN incident (incident response preparedness and situation assessment; exposure assessment; acute health effects; long-term health effects; and recovery phase).

Another important aspect of our group will be the development of relevant resources to cover specific training to respond to bioweapons, which use agents found in the nature or human-modified in the laboratory to increase their resistance, and may be viruses, bacteria, protozoa, fungi, or toxins. The specific resources generated during our work will be also applicable to tackle outbreaks due to zoonotic pathogens, which have significantly increased due to different global phenomena including migration, international trade and climate change, and increasing levels of drug resistance in protozoan and helminth parasites. Strengthening animal and medical parasitology research and education is therefore pivotal to responding to and preventing these events and future biological outbreaks.

Other secondary objectives related with the implementation of our CBRN training will be:

- Increase the motivation and participation of students through the use of a highly interactive virtual resources with gamification elements, which will make the study of disaster medical and CBRN preparedness and response more attractive for students.

- Promoting self-study and self-evaluation, since the student will have access to our virtual resources at all times via the Internet, so they will be able to acquire knowledge at a more appropriate pace than they normally would due to the high student/teacher ratio.
- Being available online, these new virtual resources will allow blended or remote teaching during situations similar to those generated by the state of alarm due to COVID19, in which social distancing measures were necessary to control the pandemic.
- Improve the linguistic competence in English of our students, as well as their international curriculum, since the educational resources will be prepared in English to facilitate their dissemination and use.
- Facilitate the introduction of our training in Universities from developing countries or with fewer resources.

4. Metodología de trabajo

(Se debe incluir la metodología de trabajo que se seguirá para la consecución de los objetivos propuestos)

To meet the different objectives described, we will use a combination of methods, including:

- Virtual resources will be built following previous successful experiences carried out by our team, specifically those followed for the development of the e-Parasitology© package, an open-access website resource available at http://parasitology.dmu.ac.uk/ (Peña-Fernández et al., 2020). Thus, academics and experts involved in this project will develop storyboards to enable a multimedia IT developer to build each module/resource/game that target specific organisms constituting major biological hazards. Moreover, specific modules in public health/medical preparedness, mass casualty, risk assessment and biomonitoring, and environmental recovery/restoration for different CBRN agents will be also developed by experts in these fields.
- These virtual resources will be populated with interactive and engaging materials in conjunction with formative assessments: videos, case studies, podcasts and quizzes. To improve students' learning experience internal students will be recruited as producers at the different participating universities.
- Development of specific CBRN units for the virtual laboratory and case studies modules to encourage self-learning and autonomous work; they will be enhanced by the Virtual Microscope and Pathology Laboratory already available at the open-access e-Parasitology website. The CBRN virtual case studies created will facilitate the development of students' abilities to critically evaluate and enhance reflection; skills that have shown to facilitate acquisition of clinical skills in students in a previously conducted teaching initiatives carried out by our team (Peña-Fernández et al., 2018, 2019).
- Strengthening our virtual provision by the development of mini games built in apps in collaboration with multimedia developers for the support of the teaching and learning of CBRN preparedness and response. Students will be able to acquire the specific competences to respond to CBRN emergencies described by the European Commission through gamification.
- Generation of 3D printed models from bi-dimensional images of helminths' eggs and other parasitic structures based on their real morphological and morphometric characteristics, for

enriching the teaching-learning process applicable in presential or remote teaching (Dias et al., 2022).

- Production of training guidelines to respond to CBRN, in form of textbooks, leaflets and related means, to be published by different editorials including the UAH editorial (https://publicaciones.uah.es/).

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5. Cronograma

(Se incluirá un cronograma de la ejecución del plan de trabajo en tres años, indicando los hitos más representativos)

First phase (2023-24)

1) Mini e-learning units will be created to cover the core CBRN training response content, including the identified basic competences aimed at covering the different phases of a response to a CBRN incident: incident response preparedness and situation assessment; exposure assessment; acute health effects; long-term health effects; and recovery phase (Sandström et al., 2014). All units will include formative assessments (videos, podcasts and quizzes).
2) Enhancement and development of the *Virtual Laboratory* and *Virtual Clinical Case Studies* with a collection of different virtual CBRN case studies. They will present a medical history and/or a CBRN incident, the user will need to address the incident by tailoring an effective response to protect the public and the environment and decontaminate the impacted environment to minimise the risks .
3) Preparation and submission of a proposal to publish a textbook on CBRN response. Identification of potential authors from reputed organisations to draft the different chapters.
4) Implementation of previous resources developed by our team, specifically the e-Parasitology and our initial training to respond to small chemical/biological incidents, in different undergraduate and postgraduate modules at different UAH programmes.

Second phase (2024-25)

1) Developed new resources will be piloted during the second academic year at each participating university and students will be able to provide comprehensive feedback.

2) Identification of Multimedia Developers to aid with the production of games and remaining virtual resources. Developers will use the Unity software (Unity Technologies) to develop the game app.
3) Pilot game app will be tested with a focus group of students using a beta tester link for appropriateness before completion of the final game app.
4) Production and peer review of the different chapters for the CBRN textbook and related materials.
5) Submission of a proposal to develop a MOOC course on CBRN response.

Third phase (2025-26)

1) Comprehensive feedback collected on the different virtual and 3D resources and game app developed will be analysed to be published in a peer-reviewed journal.
2) Publication of the textbook and related written materials.
3) Dissemination of our results at international teaching congresses and in other educational arenas.

(*) En el plan de trabajo se deben incluir al menos los apartados que se indican.