

MCAST
RESEARCH & INNOVATION
EXPO 23

The 5th MCAST Research &
Innovation Expo
14th - 15th December 2023



MCAST

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**MCAST
RESEARCH & INNOVATION
EXPO 23**

FOREWORD



MCAST

MESSAGE FROM THE PRINCIPAL

Professor Joachim James Calleja

Principal and CEO of MCAST

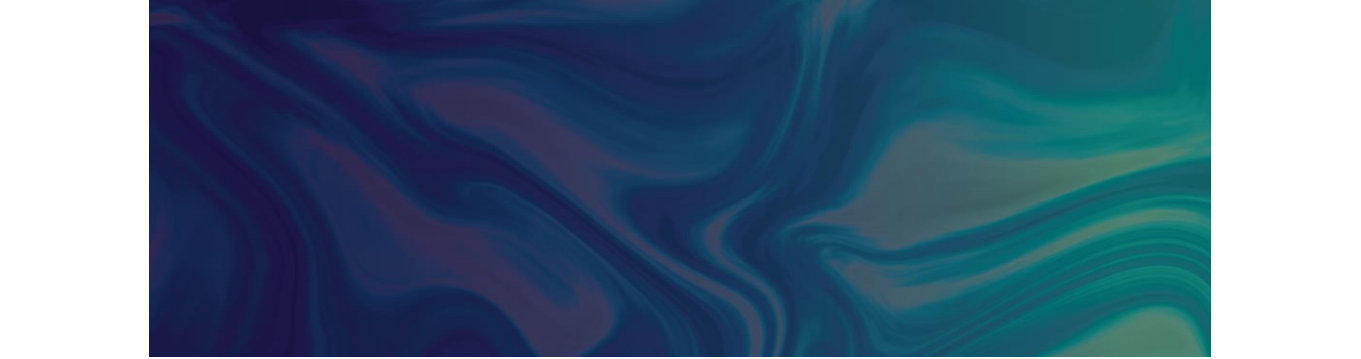


As we unveil the fifth edition of the MCAST Research and Innovation EXPO, it is with a sense of pride and anticipation that I invite our academic community, industry partners, and the public to read through this publication that embodies the evolving landscape of applied research. This year, our EXPO is a vibrant demonstration of the synergies between academia and industry, and their collective impact on society and quality of life.

This year's EXPO marks a significant strategic shift towards a more cohesive research approach. Our annual goal is to forge a connection where academic exploration and industry innovation intersect, fostering research that is not only pioneering but also directly applicable and beneficial to our collaborative sectors. This commitment is underscored by our recent investments in Research & Innovation infrastructure, including the acquisition of advanced Optical Motion-Capture Cameras (MOCAP) and a Semi-humanoid robot in 2023. These tools are pivotal in enhancing our research capabilities and providing our students with hands-on experience in cutting-edge technology.

Our methodology is rooted in data-driven analysis and attuned to emerging trends. The launch of the inaugural MCAST monograph series is a landmark achievement in our pursuit of academic excellence. Additionally, the Applied Research and Innovation Centre (ARIC) organised seven critical training events in 2023, drawing the participation of 76 MCAST staff members. These events, ranging from Motion Capture-Camera Shogun Live Training to Research Excellence Programme Proposal Writing Workshops, are crucial in strengthening professional competencies and fostering career advancement.

In alignment with our strategic goals, we are dedicated to promoting the development of applied research and sustainable innovation throughout the College. We are ensuring that our research endeavours are coordinated with universal objectives and future-focused education, aligning our projects with the United Nations Sustainable Development Goals, among other key initiatives. The introduction of the new Master in Artificial Intelligence for Industry 4.0 is a



strategic move to prepare our students for the evolving workforce and resonates with our commitment to providing impactful and relevant education.

The essence of the EXPO is its ability to inspire. It is a celebration of research igniting a drive towards innovative problem-solving and cross-disciplinary collaboration. The EXPO serves as a breeding ground for new ideas, unexpected partnerships, and visions of a future where research and innovation yield tangible societal benefits.

At MCAST, we hold the conviction that the true value of research excellence is measured by its application and consequently its societal impact. This year's EXPO will spotlight projects that embody this philosophy, featuring research with the potential to transform industries, shape societal norms, and enhance overall life quality. Our dedication to impactful research is a pledge to make a real difference. EXPO 2023 is more than just an exhibition; it is a platform for exploration, collaboration, and the discovery of possibilities that our research can unlock for society. From our inaugural EXPO to this fifth edition, MCAST has experienced a transformative journey in a research culture focused on issues of social and economic concerns. Our researchers are educators, innovators, and industry collaborators, whose work not only propels academic knowledge but also makes significant contributions to societal advancement.

As we eagerly anticipate EXPO 2023, I invite you to go through this publication of knowledge and innovation. The MCAST Research and Innovation EXPO 2023 is where academia and industry meet for the greater good.

THE R&I EXPO ORGANIZING COMMITTEE

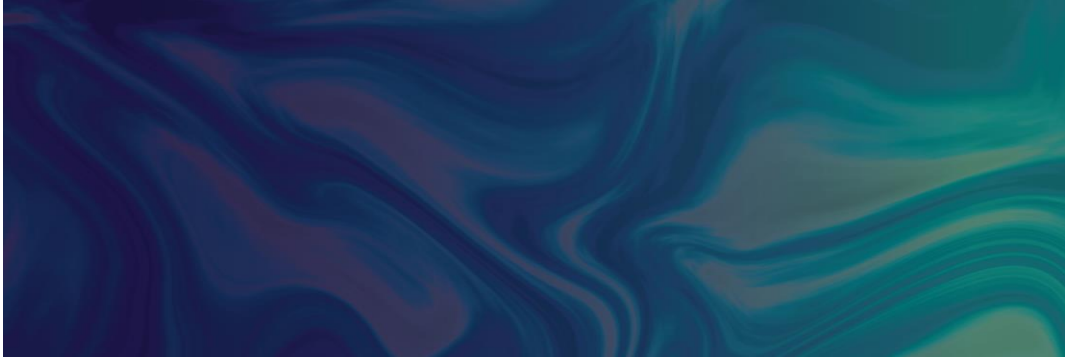


Dr Tatjana Chircop

*MCAST Deputy Principal for Research & Innovation
Applied Research & Innovation Center (ARIC)*

Dr Tatjana Chircop is the Deputy Principal for Research and Innovation at MCAST. Her main areas of expertise are youth and community studies, vocational education (VET) and performing arts. Leading a team of researchers at the college, she has worked on researching challenges that students find in their educational journeys as well as innovative pedagogical tools which enhance learning, such as gamification. She has also led the initiative to introduce the role of student mentors at MCAST with the student mentoring service now running for the 5th year. In her role as Deputy Principal for Research and Innovation, she leads the Applied Research and Innovation Centre (ARIC) and the MCAST Library. Within ARIC, a number of master's programmes are delivered, including the Master in Research Methods and the Master by Research, as well as the professional Doctorate programme. Over the years, she has also been involved in teacher training at MCAST, most recently through the innovative Master's degree in Vocational Education Applied Research 4.0.

Prior to joining MCAST, Dr Chircop was a professional musician with the Manoel Theatre Orchestra and the National Orchestra and taught violin and pianoforte performance at the Johann Strauss School of Music. Subsequent roles included those of learning support assistant and community development worker. Within MCAST, Dr Chircop was a lecturer and later a Director of the Institute of Community Services, Head of the Foundation College and Deputy Principal for Arts and Social Sciences. Dr Chircop graduated with a BA Hons in English (University of London), a BA Hons in Youth and Community Studies (University of Malta), a MA in Youth and Community Studies (Brunel University), a Master in Intercultural Eco-Management of Schools (Universita' Ca Foscari), a Post-Graduate Certificate in Vocational and Educational and Training (MCAST) and a PhD (Brunel University).



Dr Lorna Bonnici West

*MCAST Director for Research and Innovation
Applied Research & Innovation Center (ARIC)*

Dr Lorna Bonnici West is the Director for Research & Innovation at MCAST, instigating scientific research excellence initiatives across the organisation, in collaboration with a group of highly professional and proficient colleagues at ARIC. Dr Bonnici West, together with the ARIC colleagues, has been instrumental in steering research groups and themes, drive and support the adoption of research initiatives by institute academic staff and has been highly active in supporting research teams in the writing of research proposals for different funds.



Prior to her engagement at MCAST, Lorna worked as a principal clinical pharmacist at Mater Dei Hospital. Since January 2020 she joined MCAST as a Senior Research Officer supporting the Institute of Applied Sciences. Dr Bonnici West also holds a post of Visiting Senior Lecturer with the Department of Clinical Pharmacology and Therapeutics, University of Malta.

Dr Bonnici West graduated in Pharmacy from the University of Malta in 2000. She read for a Master of Science degree in Clinical Pharmacy at the Robert Gordon University, Scotland, graduating in 2006, and was awarded a scholarship by the Malta Government Scholarship Scheme to read for a PhD at the Robert Gordon University, Scotland, graduating in 2015. In 2016, she was awarded a post-doctoral grant under the Reach-High Scholars Programme Scheme, part-financed by the European Union, European Social Fund.



Dr Judita Tomaskinova

*MCAST Deputy Director for Research and Innovation
Applied Research & Innovation Center (ARIC)*

Dr Tomaskinova graduated in Environmental Management from the Matej Bel University in Banska Bystrica (Slovakia). Her associate professorship thesis, which was submitted within the sphere of applied and landscape ecology (at Mendel University in Brno, Czechia), dealt with the integrated management and supply of cultural ecosystem services in selected protected areas in the Maltese Islands. Her Ph.D. dissertation was in environmental management, specifically on the assessment of integrated protected area management and environmental education, and was written in collaboration with Dr Sean Prendergast (Peak District National Park, UK). As a background, she has more than 25 years' experience in the field of education, research management and project management. Judita has worked at the Slovak Museum of Nature Protection and Speleology for over fifteen years, and went on to hold a senior academic position at Matej Bel University in the Slovak Republic for over ten years. She subsequently moved to the Maltese Islands and worked as a Senior Researcher for the ReNature project within the MCAST Institute of Applied Sciences, and as a Research Project Manager within the Research Support Services Directorate at the University of Malta.

Her areas of research interest are broadly focused on the management of protected areas around Europe; ecosystem services; soil respiration in the context of climate change; phytoremediation; life-cycle assessment (LCA); environmental education, and education for sustainable development.

The ARIC Senior Research Officers Team



LLM Gonca Kara

*MCAST Senior Research Officer
Applied Research & Innovation Center (ARIC)*

Ms Gonca Kara Demir has studied Law and holds an LLM degree from the University of Sussex with vast experience and knowledge in EU focused ICT and Intellectual Property Rights Law as well as R&I management within IT Industry. As an R&I manager, she has over 10 years of experience working on EU and National Funding Programmes in particular related to ICT, Smart Cities, Environment, and Digital Skills where she actively uses as part of her role as a Senior Research Officer at the IICT. Her expertise includes project & programme management and dissemination in EU funding programs such as Horizon Europe, European Institute of Innovation & Technology (EIT), EUREKA, MarTeRA, Innovation Grants and Acceleration programs for Startups. Currently, actively collaborates with the ICTAR research team of IICT and works on internalization of the research at IICT.

Dr Eng Ajay Sharma

*MCAST Senior Research Officer
Applied Research & Innovation Center (ARIC)*

Dr Ajay Sharma is one of the most recent members to join the Applied Research and Innovation Centre (ARIC) within the Institute of Applied Sciences in 2023. Dr Ajay is an expert in the fields of Electronics and Communication Engineering especially in Microwave and Optical Communication. Dr Ajay has a strong record in teaching, research, and academic administration for over 18 years. During this period, he gained lecturing experience teaching Communication Engineering related subjects at the Department of Communication Engineering of the various reputed Universities of India. He was a



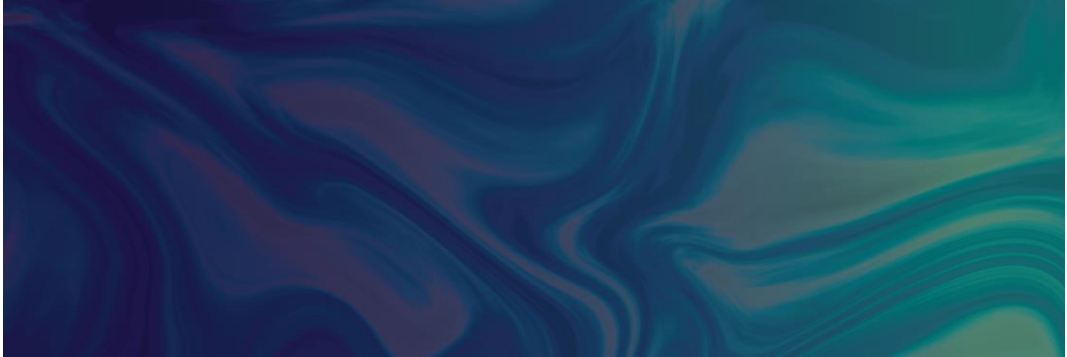
member of the Institution's Innovation Council (IIC) Ministry of Education, in his previous organisation. His expertise includes EU funding programs such as "Marie Skłodowska-Curie Actions Postdoctoral Fellowships" (MSCA - PF) proposal writing and proposal submission, through the University of Malta. He has published many research papers in SCI and Scopus Indexed Research Journals including IEEE, De Gruyter and published two Indian Patents. He earned his Bachelor's and Master's degrees in Electronics and Communication Engineering in 2000 and 2006 resp., and a doctorate degree in Optical Communication Engineering (Thapar University) in 2017.



Dr Sarah Camilleri

*MCAST Senior Research Officer
Applied Research & Innovation Center (ARIC)*

Dr Sarah Camilleri is one of the most recent members to join the Applied Research and Innovation Centre (ARIC) earlier in 2022. Her experience is research was mostly earned between 2008 and 2015, through master's and doctoral programs in Water, Marine and Coastal Management at the University of Cadiz (Spain) and the University of Bologna (Italy); exploring themes including fisheries management, wetland management, spatial analysis and remote sensing applications amongst others. In 2016 she took up the role of environmental officer within the local public sector, working in the implementation of international/EU/national policy linked to the protection of the marine and water environment and resources. Sarah's involvement at MCAST started in 2020 with the supervision of MSc students at the Institute of Applied Science, and later as researcher within agriculture related projects. Through her new role as Senior Research Officer, Sarah works to support the Institute of Business, Management and Commerce in its research and innovation endeavours. Further she participates in the development of PRIMA and Horizon funded projects supporting innovation initiatives within the agricultural field.



Dr Francis Delicata

*MCAST Senior Research Officer
Applied Research & Innovation Center (ARIC)*

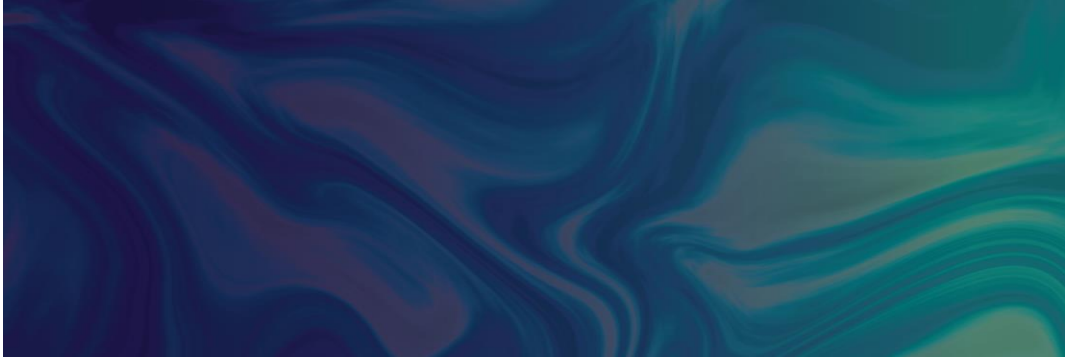
Dr Francis Delicata holds a PhD in Neuroscience (Aston University, UK) and has over 9 years of experience in an academic research environment. His doctoral and post-doctoral studies were supported by a Marie Skłodowska–Curie ITN PhD fellowship and an ASRP Canada Postdoctoral fellowship. With a focus on neuron-glia interactions in health and disease, Francis has collaborated with various International neuroscience research groups. The motivation of his research has been to understand the fundamental mechanisms of disease, such as addiction, epilepsy and Alzheimer’s Disease, aiming to identify more effective treatments. Currently serving as a Senior Research Officer at ARIC, he is supporting research initiatives at the Institute of Engineering and Transport.



Dr Massimo Pierucci

*MCAST Senior Research Officer
Applied Research & Innovation Center (ARIC)*

Dr Massimo Pierucci holds a degree in Biological Sciences and more than fifteen years of research experience in the field of neuropharmacology and neurophysiology. During this period, he had the opportunity to supervise and co-supervise undergraduate, master and PhD students, offering both experimental and theoretical guidance, and to gain lecturing experience teaching biological subjects at the Department of Psychology of the University of Malta. This experience has enabled Massimo to promote, support and structure research endeavours through the Institute of Community Services, fulfilling his role of Senior Research Officer. The Institute has recently seen an uptake of different research activities, with projects spanning from sport, social and education research and taking into consideration the vocational education mission of the Institute.



The ARIC Design and Development Team

Ms Lisa Theuma

MCAST Researcher

Applied Research & Innovation Center (ARIC)

Ms Lisa Theuma, with a passion for learning and exploration, has consistently involved herself in investigating the various fields within the vast world of game art and design throughout her education and aspires to cultivate her knowledge through her work. After recently acquiring her Bachelor's degree in Game Art & Visual Design from MCAST's Institute for the Creative Arts, Lisa set her sights on strengthening her skills and building innovative learning experiences, thus taking on the role of Ed-Tech Researcher. Lisa aims to apply her creativity to future research projects and support their development within the Applied Research & Innovation Centre, ultimately providing entertaining and educational experiences for others.



Mr Geoffrey Attard

MCAST Researcher

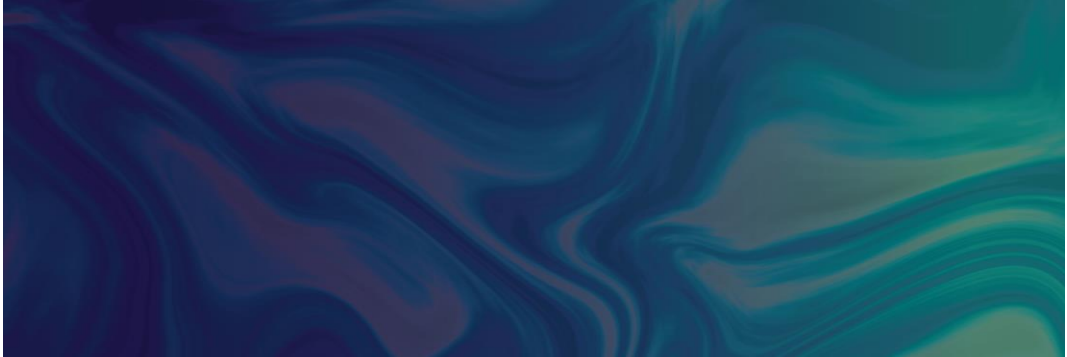
Applied Research & Innovation Center (ARIC)

Mr Geoffrey Attard recently joined the ARIC Department at MCAST. He has completed his Master's by research in 2020, where he developed an innovative EdTech toolkit called TangiBoard. He studied at Middlesex University where he also graduated in a Computer Science Degree with first-class Honours. He was involved in various projects ranging from software/web development, mobile app/game development, electrical/electronics, robotics, networking, artificial intelligence, computer vision, mechanical engineering and educational technologies. Coming from a military background, he always works with a mindset that giving up is never an option, there is always a way.

PROGRAMME HIGHLIGHTS

Thursday 14th December 2023:

8:30 – 9:00	Welcome Coffee
9:00 – 9:15	<p>Opening Ceremony</p> <p>Dr Lorna Bonnici West Director for Research & Innovation (MCAST)</p> <p>Dr Tatjana Chircop Deputy Principal for Research & Innovation (MCAST)</p> <p>Prof Joachim James Calleja Principal and CEO (MCAST)</p> <p>Hon. Clifton Grima Minister for Education, Sport, Youth, Research and Innovation</p>
9:15 – 10:15	<p>Session 1 – Panel Discussion</p> <p><i>Opportunities and challenges of using conversational AI in education and research.</i></p>
10:15 – 10:45	Coffee Break
10:45 – 12:45	<p>Session 2 – Presentations</p> <p><i>Education and Sustainability through EdTech and CleanTech</i></p>
12:45 – 13:30	Lunch Break
13:30 – 15:00	<p>Session 3 - Workshops</p> <p>(1) Promoting Hydration Across the Lifespan (2) Research project management: sharing of good practices (Waterline Project) (3) Annotation of Benthic Species Workshop (AMBULANT Project) (4) The H.E.A.R.T approach: a toolkit for adult educators and other front-line workers working with young people</p>
15:00 – 16:30	<p>Session 4 - Presentations</p> <p><i>Vocational education and entrepreneurship</i></p>
16:30	End of Day One



Friday 15th December 2023:

8:30 – 9:00	Welcome Coffee
9:00 – 09:15	Welcome Speeches Prof Joachim James Calleja <i>Principal and CEO (MCAST)</i> Hon. Keith Azzopardi Tanti <i>Parliamentary Secretary for Youth, Research and Innovation</i>
9:15 – 11:50	Session 1 – Presentations <i>Vocational education and entrepreneurship</i> <i>Creative Arts Research</i> <i>Cultivating Sustainability in Natural Ecosystems</i>
11:50 – 12:20	<i>Coffee Break</i>
12:20 – 13:30	Session 2 – Presentations <i>Technology for exploration, monitoring and industry</i>
13:30 – 14:15	<i>Lunch Break</i>
14:15 – 15:15	Session 3 – Presentations <i>Social Sciences, Health & Food</i>
15:15 – 15:30	<i>Coffee Break</i>
15:30 – 16:30	Session 4 – Presentations <i>Social Sciences, Health & Food (cont.)</i>
16:30	Closure

PROGRAMME OUTLINE – DAY 1

THURSDAY 14TH DECEMBER

ROOM: AUDITORIUM – MRC BUILDING

8:30 – 9:00	WELCOME COFFEE
9:00 – 9:15	<p>OPENING CEREMONY</p> <p>Dr Lorna Bonnici West <i>Director for Research & Innovation (MCAST)</i></p> <p>Dr Tatjana Chircop <i>Deputy Principal of Research & Innovation (MCAST)</i></p> <p>Prof Joachim James Calleja <i>Principal and CEO (MCAST)</i></p> <p>Hon. Clifton Grima <i>Minister for Education, Sport, Youth, Research and Innovation</i></p>
SESSION 1 9:15 – 10:15	<p>PANEL DISCUSSION</p> <p><i>Opportunities and challenges of using conversational AI in education and research.</i></p> <p>MCAST/Guest panelists</p>
10:15 – 10:45	Coffee Break
SESSION 2 10:45 – 12:45	<p>RESEARCH PRESENTATIONS</p> <p>Education and Sustainability through EdTech and CleanTech</p> <p><i>Empowering Learning Through Game Creation: Investigating the Impact of Educational Technology on Students' Engagement and Attainment Level in Subject-Based Game Design.</i></p> <p>Silvio Nocilla</p> <p><i>Re-thinking the teaching of mathematics: COVID-19 and beyond</i></p> <p>Marouska Zahra Micallef</p> <p><i>Transforming advanced water skilling through the creation of a network of XR water emulative centres</i></p> <p>Daren Scerri, Lorna Bonnici West and Edwin Zammit</p> <p><i>Unpacking the Pedagogical Potential: An Investigation into the Effectiveness of ChatGPT-Generated Lesson Plans in Modern Vocational Education</i></p> <p>David Deguara, Daren Scerri, Gerard Said Pullicino, Thomas Gatt</p> <p>DATAVISUAL</p> <p>Frankie Inguanez</p>



	<p><i>Autonomous application for information mapping scrapbook during the dissertation journey (STAR)</i> Gerard Said Pullicino, Stephane Role, Lorna Bonnici West, Alan Gatt, Daren Scerri, Lisa Theuma, Geoffrey Attard</p> <p><i>Data Exploration, Computation, and Optimization for Discovery and Experimentation (DECODE)</i> Frankie Inguanez</p> <p><i>EIT Urban Mobility Regional Innovation Scheme Hub Malta</i> Pelin Uner</p> <p><i>Enhancing Education Curricula on Electromobility (TRAILS)</i> Albana Gerxhi, Andy Bugeja</p> <p><i>Mediterranean Island Cleantech Innovation Ecosystem (MICIE) project</i> Rozela Franco</p>
12:45 – 13:30	Lunch Break
SESSION 3	WORKSHOPS 1 – 4
13:30 – 15:00	<p>(1) <i>Promoting Hydration Across the Lifespan</i></p> <p>(2) <i>Research project management: sharing of good practices (WATERLINE project)</i></p> <p>(3) <i>Annotation of Benthic Species Workshop (AMBULANT Project)</i></p> <p>(4) <i>The H.E.A.R.T. approach: a toolkit for adult educators and other front-line workers working with young people</i></p>
SESSION 4	RESEARCH PRESENTATIONS
15:00 – 16:30	<p>Vocational education and entrepreneurship</p> <p><i>Green Labs 4 VET</i> Olivia Siino</p> <p><i>Connecting VET schools and Industry 4.0 through 'Making'</i> Damian Brincat</p> <p><i>Development of the Entrepreneurial Mindset Curriculum</i> Maria Ragia</p> <p><i>Taking the leap into female entrepreneurship: The motivating factors of educators investing in small businesses in Malta.</i> Theresa Demanuele Montebello</p> <p><i>Enhancing Vocational Programming Education through Gamified Digital Learning: The GOLEM Initiative</i> Paul Pulis</p> <p><i>EQVEGAN</i> Joshua Bugeja</p>
16:30	End of Day One

PROGRAMME OUTLINE – DAY 2

FRIDAY 15TH DECEMBER

ROOM: AUDITORIUM – MRC BUILDING

8:30 – 9:00	WELCOME COFFEE
9:00 – 9:15	<p>WELCOME SPEECHES</p> <p>Prof Joachim James Calleja <i>Principal and CEO (MCAST)</i></p> <p>Hon. Keith Azzopardi Tanti <i>Parliamentary Secretary for Youth, Research and Innovation</i></p>
SESSION 1	RESEARCH PRESENTATIONS
9:15 – 9:40	<p>Vocational education and entrepreneurship</p> <p><i>Tools for T</i> Nadia Boffa <i>How do innovation hubs help start ups exploit and expand business opportunities? MITA: case study</i> Nadia Boffa</p>
9:40 – 11:10	<p>Creative Arts Research</p> <p><i>Applying a multidisciplinary approach in completing a dissertation in subjects in the Creative Arts</i> Ian Attard <i>Transformative Learning in the Music Industry: An Autoethnographic Study of a Music Producer's career towards academia</i> Cassandra Sturgeon Delia and Rene Mamo <i>Teaching, Practice and Performance Strategies in Instrumental Music Teaching in Malta.</i> Alistair Attard <i>The Magic Potion for the Immortality of the Maltese Song: L-Aħħar Bidwi f'Wied il-Għasel.</i> Rene Mamo <i>Documenting Maltese Illustration - An Observational and Exploratory Analysis of Common Themes, Potentials, and Challenges in Contemporary Maltese Illustration - Mural and Visual Research</i> Ruth Ancilleri <i>Documenting Maltese Illustration - An Observational and Exploratory Analysis of Common Themes, Potentials, and Challenges in Contemporary Maltese Illustration</i> Maira Scicluna Zahra <i>Queer characters on the Maltese stage in the 1970s</i> Tyrone Grima</p>



<p>11:10 – 11:50</p>	<p>Cultivating Sustainability in Natural Ecosystems</p> <p><i>UNified framework to cope with droughts under MEDiterranean climate change conditions (UNIMED)</i> Carmelina Frendo</p> <p><i>MED-WET - Sustainable Water Irrigation and Supply for Agriculture</i> Francesca Busuttil</p> <p><i>Modernizing Agriculture Knowledge and Innovation Systems (modernAKIS): A Step into a 7-year journey</i> Sarah Camilleri</p> <p><i>Substantial increase in urban breeding Blue Rock Thrush Monticola solitarius (il-Merill) in Malta.</i> Natalino Fenech</p> <p><i>Interactions between bottlenose dolphins and small-scale fisheries in Malta</i> Kimberly Terribile</p>
<p>11:50 – 12:20 Coffee Break</p>	
<p>SESSION 2 RESEARCH PRESENTATIONS</p>	
<p>12:20 – 13:30</p>	<p>Technology for exploration, monitoring and industry</p> <p><i>Sensor Fusion for Underwater Robot Localisation</i> Jeremy Scerri</p> <p><i>AutonoMous Bio-mimetic Underwater vehicle for digitAI cage monitoring</i> Owen Sacco</p> <p><i>SMARTPOL - Environmental Monitoring</i> Juan Jose` Bonello</p> <p><i>A study into the design of a remotely-controlled and autonomous sea-faring drone for monitoring water quality in the sea.</i> Mark Theuma</p> <p><i>Obstacle Avoidance in the SmartPol Project</i> Kevin Theuma</p> <p><i>Continuous Assessment of Pollutants and Environmental Events via Satellite Data (CAPES)</i> Daren Scerri, Frankie Inguanez, Juan Jose Bonello</p> <p><i>STREAMing on-demand satellite data</i> Video by Aldo Drago</p> <p><i>A Satellite Damage Sensor</i> Kevin Theuma</p> <p><i>Intelligent Inventory - Using data to predict inventory safety stock in Industry</i> Stephane Role</p> <p><i>An overview on Smart Ballistic Optimization for Repairing of Aerospace Exostructures using 3D printed Kevlar</i> Leonardo Barilaro</p>
<p>13:30 – 14:15 Lunch Break</p>	

<p>SESSION 3</p>	<p>RESEARCH PRESENTATIONS</p>
<p>14:15 – 15:15</p>	<p>Social Sciences, Health & Food</p> <p><i>Exploration and Implementation of Products with Alternative Proteins in Mediterranean Region</i> Frederick Lia <i>Bioactive compounds extracted from Olive mill waste</i> Frederick Lia <i>ANTIVIRAL MEDHERBS: Investigating the antiviral activity and immunomodulatory effects of Mediterranean herbs and spices against SARS-CoV-2</i> Jean-Pierre Brincat <i>Religious autonomy-support and Children’s Prosociality</i> Isabelle Zammit <i>Why is Hydration Important in Healthcare?</i> Marisa Vella</p>
<p>15:15 – 15:30</p>	<p>Coffee Break</p>
<p>SESSION 4</p>	<p>RESEARCH PRESENTATIONS</p>
<p>15:30 – 16:30</p>	<p>Social Sciences, Health & Food (cont.)</p> <p><i>Preventing Dropping Out In Post-Secondary Education Focusing On Lower-Level Courses At The MCAST Institute Of Community Services</i> Marilyn Pace Mintoff <i>An exploration of student biographies in Higher education: A narrative inquiry.</i> David Callaby Florida <i>Childhood obesity in the Mediterranean Islands</i> Paul Calleja <i>The Fun Fit 5 (FF5) Project - A Study of a Daily Physical Activity Programme in Primary Schools in Malta</i> Melanie Darmanin, Renzo Kerr-Cumbo, Matthew Muscat Inglott and Heathcliff Schembri <i>Student-Researchers as Co-constructors of the PE Curriculum - Study Protocol</i> Anna Maria Gatt</p>
<p>16:30</p>	<p>Closure</p>



**MCAST
RESEARCH & INNOVATION
EXPO 23**

***A SELECTION OF ONGOING
INTERNALLY FUNDED PROJECTS***



MCAST

INTERNALLY FUNDED PROJECTS - ONGOING

Queer characters on the Maltese stage in the 1970s

Tyrone Grima

MCAST Institute of Creative Arts

BACKGROUND

Queer performance is an area that has not been studied in the Maltese artistic and academic circle. This is not surprising. Despite the changes of the legal structure giving the LGBTIQ+ community more rights and the change in mentality that ensued as a result, few are the examples of theatrical productions that can be defined as queer performances, and most of them have been staged in the last five years. However, queerness on stage has always present, implicitly or explicitly. Throughout the history of theatrical performance in Malta, queer themes have been explored and queer characters have been represented, albeit reflecting the social-political milieu of the period when they were staged. This project will focus on these dynamics in the 1970s, a very interesting period in the history of Maltese theatre, where there was a lot of significant experimental work, often defying and challenging artistic and social mores, happening side by side with more conventional work.

OVERALL AIM

The overall of this project is to explore how queerness, manifested through the interpretation of queer characters on stage developed in Malta after the decriminalisation of homosexuality in 1973.

MAIN EXPECTED OUTCOME/S

The expected outcome is raise awareness on the development of queerness in the Maltese theatre, and to analyse the differences and/or similarities of what was being expressed artistically and what was happening on a social and political level locally.

RESULTS

The preliminary results from the spadework which was done in the preparation on this research project is that in drama, queer characters were depicted as dangerous or as persons who cannot experience fulfilment in life, whereas in comedy they were used derogatorily.

IMPACT OF RESEARCH

The project will have an impact in the scientific field since this research is original and has never been held before. Although there are a number of histories on the Maltese theatre, and studies on queerness on stage have been held in other Mediterranean countries, this has not been done in Malta before. It will also impact society because it will raise further awareness on queerness in our society, particularly in the light of the legacy of Europride that will be held for the first time in Malta this September.

KEYWORDS

Queer, theatre, queer theory, sociopolitical development



Empowering Learning Through Game Creation: Investigating the Impact of Educational Technology on Students' Engagement and Attainment Level in Subject-Based Game Design.

Silvio Nocilla¹, Monaliza Nocilla²

¹ MCAST Institute of Information and Communication Technology

² MCAST Inclusive Education Unit

BACKGROUND

Games are an engaging way for students to acquire and retain information, and they can benefit from creating their own games based on the content they are studying. Although gamification-based learning is well-known for its popularity among students in the 21st century, minimal research has been conducted on the strategy of engaging students in student-led learning by having them create their own games for learning.

In recent years, educators have shown a growing interest in employing innovative pedagogical approaches with the goal of enhancing students' engagement and participation to promote deep learning (Guy Claxton and Michael Fullan). The combination of flipped learning and gamification has garnered significant attention as an emerging strategy with the potential to transform traditional pedagogical and/or andragogical approaches. The concept of flipped learning entails reversing the conventional classroom structure, in which students are exposed to instructional materials outside of class to conduct interviews, collect evidence related to the topic at hand etc..., and then use the in-class time for interactive learning by analysing and comparing the data collected. Alternatively, gamification entails the application of game design elements and principles to non-game-related contexts. Gamification's primary objective is to increase student engagement and participation while they strive to achieve their learning objectives.

OVERALL AIM

This small-scale study's primary objective is to investigate effective teaching and learning approaches based on an unconventional combination of flipped learning gamification methods with the potential to enhance students' learning processes through continuous engagement and participation. In the context of Vocational Education and Training, this research aims to enable students to create their own game concepts based on structured curriculum topics.

MAIN EXPECTED OUTCOME/S

The concept of student empowerment entails the expectation that students adopt an innovative educational methodology that emphasises the utilisation of

successful inquiry-based learning methodologies. It is expected that students will exhibit heightened levels of creativity and critical thinking abilities. Furthermore, students will assume responsibility for their academic disciplines and cultivate a deep comprehension of the significance of collaboration through collective endeavours.

Lecturer Awareness: It is intended that lecturers develop a greater understanding of their changing roles within this unique instructional style. The recognition of the need to incorporate continual assessment evaluations and assume the dual responsibilities of mentorship and mediator in students' academic advancement will be acknowledged.

Resistance to Change: The implementation of new educational methodologies, namely those that deviate from traditional lecture-based techniques, may face opposition during the process of change. The expected resistance stems from the process of educators and students adjusting to the new learning paradigm.

It is expected that the data gathered during phase 2 will serve as the foundation for the development of an instructional design framework for flip gamification lessons.

RESULTS

Phase 1 Results: The process of designing educational games has been shown to enhance students' creative abilities. The meta-analysis conducted on multiple studies demonstrates the possibility of using game design aspects in order to augment engagement, motivation, teamwork, and learning results. The implementation of flipped gamification has been found to have a favourable influence on various cognitive aspects, including creativity, learning attitude, and problem-solving abilities. The approach fosters a transition towards a student-centered learning environment and facilitates the development of crucial skills.

IMPACT OF RESEARCH

The Curriculum: There is a possibility that gamified e-learning systems or flipped gamification do not exhibit significant changes in statistical learning outcomes, but they do enhance motivation and promote sustained engagement in the learning process. The importance of student leadership and engagement in game-creation initiatives cannot be overstated, since these factors play a pivotal role in cultivating favourable results. The use of authentic learning circumstances within collaborative teams has been found to result in enduring positive attitudes toward the learning process.



KEYWORDS

Students' game creation, Student-led Learning, Engagement, Game Based Learning, Creativity, Critical Thinking.

Documenting Maltese illustration - An Observational and Exploratory Analysis of Common Themes, Potentials, and Challenges in Contemporary Maltese Illustration

Moira Scicluna Zahra, Ruth Ancilleri

MCAST Institute of Creative Arts

BACKGROUND

In this paper, we undertake a comprehensive examination of contemporary Maltese Illustration from various perspectives. Our aim is to analyse common themes, identify challenges, and explore the potential for future development within the industry. To achieve this, we conduct interviews with leading figures in the field of Maltese illustration, allowing us to gain valuable insights and firsthand accounts. The research is structured into five main chapters, each addressing different aspects of the topic. The first chapter delves into the historical and contemporary contexts of Maltese illustration. This investigation encompasses three key sectors: publishing, commercial (including advertising, gaming, and entertainment), and editorial and satirical cartoons.

Building upon this historical framework, the second chapter focuses on the transformative power of illustration. The industry has exerted a significant influence on global social and political landscapes. Through several examples, we illustrate the potential for illustration to serve as a catalyst for change in contemporary society, both on a national and international level. In the third chapter, we explore the prevalent themes in contemporary Maltese illustration. This exploration is primarily based on interviews conducted with Maltese illustrators. A key theme that emerges is nostalgic illustration, which often references the evolving Maltese landscape. By analysing these interviews, we gain insights into the motivations, inspirations, and creative processes of local illustrators.

The fourth chapter examines the mediums and techniques employed in contemporary Maltese illustration. Finally, in the fifth chapter, we turn our attention to the future of illustration as an industry and art form, both in Malta and beyond. Here, we consider the challenges and opportunities presented by new technologies, particularly the emergence of AI-generated artwork. We also reflect on the role of education in fostering the growth of local illustration.

OVERALL AIM

The primary objective of this paper and the MCOI research project is to document Maltese Illustration, a subject that has not been adequately documented previously. The intention is not only to establish an archive of Maltese illustration



but also to analyse and identify recurring patterns and themes that have emerged over the years. Additionally, the paper aims to explore how the industry can be effectively harnessed to promote positive change within local communities.

MAIN EXPECTED OUTCOME/S

The anticipated outcomes of this research encompassed both positive and negative implications for the local illustration industry, and these expectations were indeed realised. Nevertheless, a significant majority of the participants interviewed and the literature reviewed have emphasised the imperative for local illustrators to continuously progress, engage in experimentation, and, most importantly, employ their artistic skills to foster transformative developments in Malta. Consequently, the emphasis is on creating artwork that not only possesses aesthetic appeal but also exhibits intellectual depth, serving as a vehicle for social and cultural change.

RESULTS

In conclusion, we propose a set of goals that the Maltese Community of Illustrators (MCOI) can adopt to drive the industry forward and ensure its continued success. Through this analysis, we offer a multi-faceted exploration of contemporary Maltese illustration. By considering its historical context, thematic concerns, technical aspects, and future prospects, we contribute to the understanding of this vibrant and evolving field.

IMPACT OF RESEARCH

The present research holds significant impact for the Maltese illustration industry and contributes to the broader landscape of creative education in Malta. It encompasses an extensive and thorough examination of the historical trajectory of Maltese illustration, providing valuable insights that are not currently available in existing literature on the subject. Moreover, the research incorporates a substantial body of primary research, specifically focused on contemporary local illustration, which further enhances its originality and contribution to the field.

The overarching objective of this study is to advocate for the development of intellectually stimulating and socially impactful projects within the realm of Maltese illustration. As a concrete manifestation of this objective, a collaborative mural is planned to be showcased at the Malta Book Festival in 2023. This mural will leverage the communicative power of visual imagery and the illustrative medium to serve as visual commentary, actively advocating for societal change in Malta. By employing illustration as a catalytic force, the research endeavours to stimulate critical discourse and inspire transformative initiatives within our society. - Arts Council Malta and National Book Council of Malta who fund the

yearly publication of the Malta Community of Illustrators Annual as well as a yearly exhibition of Illustrative Artworks that we are part of during the Malta Book Festival.

KEYWORDS

Maltese illustration, local illustration industry, illustration education, illustration as a tool for change

Applying a multidisciplinary approach in completing a dissertation in subjects in the Creative Arts

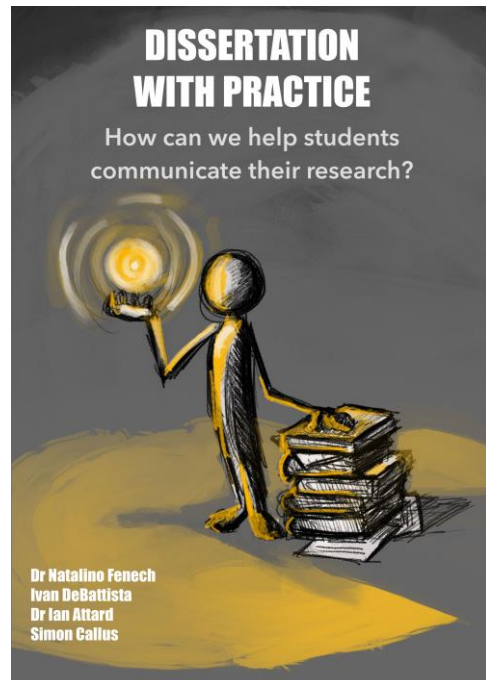
Natalino Fenech, Ivan DeBattista, Simon Callus

MCAST Institute for the Creative Arts

BACKGROUND

This research started during the academic year 2022/23 and focused on the creation of a first dissertation manual for BA Creative Media Production students and tutors. This manual helps students to understand the main objectives of a dissertation with practice, define their main research problem, choose the right research methodology to produce their creative media projects, and to articulate their main research questions.

This year's research continues last year's journey to create a dissertation manual with cross-curricular purposes at MCAST ICA. After interviews and discussions held during a seminar organized by the research team at ICA, it was clear that different departments in the creative arts share many challenges and objectives during the dissertation process. Challenges are diverse as students' projects include technical, artistic, and aesthetic research components. These can be subjective in nature and require unique and tailor-made methodological approaches in order for in-depth research in such areas to be developed. The current dissertation proposal is also a challenge. The traditional dissertation journey at MCAST, that commences from the SOI proposal till the final submission, leads most students to understand or relate to this research journey as a scientific research process. In the creative arts however, even though scientific research approaches should not be excluded, the norm is that most student projects may require inductive, innovative, and practical research approaches to allow them to develop and present their artistic research.



OVERALL AIM

Research carried out by the research group throughout the 2022-2023 academic year studied the dissertations produced by students at the end of their Bachelor of Creative Media Production course at MCAST ICA, and improve the system with which tutors are chosen, and how students are guided to present their research ideas for their dissertation with practice. The aim was to explore methods with which students can better communicate the research they carried out throughout their final year in the course. After assessing all students from the cohort and their initial dissertation ideas, a number of pilot studies were carried out, exploring different research methods (including Practice as Research), as well as different modes of presenting the research. In response, the first draft of the dissertation manual for BA Creative Media Production research projects was created. This is aimed at guiding both students and dissertation supervisors throughout the research process, in the various research methods, and using the different modes of communication to help students submit their work. Moving forward, the aim is now to amplify the dissertation manual exercise from specific guidelines focusing on the needs and demands of creative media production research to broader research realities of cross-curricular and cross-disciplinary dissertation projects in the creative arts.

MAIN EXPECTED OUTCOME/S

The research and results of this on-going project will be published in an article for a peer-review journal, presented during a seminar open for all lecturers and administrators at MCAST ICA and presented to the Board of Studies meeting in September 2024. The manual will also be made available to tutors and students from various departments across ICA in order to improve the dissertation process and outcomes.

RESULTS

Results from this on-going research project will be presented after a cross-reference study of student dissertations before this initiative and after. The aim is to reveal differences in the students' works and critical drivers motivating such differences in their artistic research endeavors, with and without the guidelines

IMPACT OF RESEARCH

The research is mostly pedagogical in nature as it directly impacts a critical part on any student's journey following a BA course in the creative arts. However, the impacts of this research may have ripple effects that go well beyond Institute level. From an educational point of view, this research reveals the need of creating different procedures related to the dissertation processes in the arts, possibly



proposing different forms of communication students could use to present their research ideas and work at MCAST. The current documents, methods of presenting dissertation ideas, and work and methods of assessment of the dissertation at MCAST do not always allow diverse methodological research approaches that are better suited in the arts. There is clearly a heavy bias towards more scientific methods of research. This leaning often causes confusion and misunderstandings on how students should be trained, guided, and tutored to help them achieve the most out of their research work.

The dissertation carried out by the student is ultimately a personal research project which often require specific tools to help them communicate their artistic questions. Improving this process and allowing the system to cater for a diverse way of thinking about research will have many positive outcomes at a personal level, at an Institutional level and at an Industry level. Primarily, the students' personal development as creators, researchers, and innovators will be given the right environment to grow in. Making this research journey more meaningful for the students will also have positive impacts on the students' confidence and attitudes when entering the world of work. This can be achieved by helping students reach their full artistic potential, giving them the necessary tools to understand and identify with the main purposes of their projects, and ultimately enjoy their own research journeys.

KEYWORDS

Cross-disciplinary, Dissertation with Practice, Vocational Research

Data Exploration, Computation, and Optimization for Discovery and Experimentation (DECODE)

Alan Gatt, Frankie Inguanez

MCAST Institute of Information & Communication Technology

BACKGROUND

The Data Exploration, Computation, and Optimization for Discovery and Experimentation (DECODE) research group is an academic team whose research focuses on data-related research through the use of machine learning and data mining techniques. The team applies this knowledge in various domains such as news, sports, and marketing.

Data Exploration: The team is skilled in retrieving, cleaning, and exploring data to identify hidden patterns for more efficient interpretation and use. Computation: The creation of models that identify hidden patterns and replicate human behaviour is one of the core skills that the team constantly research and focuses on.

Optimization for Discovery and Experimentation: The team focuses their research on hyperparameter optimization, model selection, and experimental design to help researchers and practitioners make the most of their work.

One of the goals of this team is to create content that supports young learners in their understanding of machine learning either through practical applications, setting up of workshops and/or the creation of interactive educational content.

The team strives to collaborate with members of the industry to assist in research endeavours whilst also bringing real-world case studies to the academic community. Such collaboration leads to larger, possibly funded, projects as well as academic and industry skills alignment.

The team is committed to making its research more accessible and thus the work by various members of the team has been published in academic journals and conferences with software released under open-source licenses.

OVERALL AIM

DECODE research group's main goal is to use machine learning and data analysis in applied areas including news, sports, and games amongst others. The aim of applied machine learning is to find hidden patterns in data and create computer models that can simulate human behaviour, and even improve upon this. Another DECODE's intention is to guide learners into machine learning applications and offer opportunities to work closely with industry partners on real-world projects. Our findings will also be published in academic journals, and the resulting software will be available for free to make research accessible to everyone.



MAIN EXPECTED OUTCOME/S

Better Data Understanding: Developing techniques for retrieving, cleaning, and interpreting data, leading to better insights.

Application of ML Models: Development of various machine learning models applied to various areas.

Additional Education: Creation of educational content and workshops for learners to utilise machine learning.

Industry Collaboration: Collaboration with industry members, to access and work on real-world cases and potential funding opportunities.

Knowledge Dissemination: Publication of research in academic journals and conferences, alongside open-source software, promoting accessibility and skill alignment.

RESULTS

One of the first projects that the team worked on was to create a Sudoku puzzle solver that utilizes different algorithms and monitors the performance so to produce various reporting. This tool is beneficial for learners to understand and appreciate the performance of different solution algorithms as well as to serve as a test bed to experiment on different algorithms.

The team is also currently working on formulating a course structure for an extra curriculum unit to aid students in upskilling their machine learning skills. The aim of this unit is to lead to a workshop/competition on machine learning. This unit is targeted for software degree students who can utilize this skill in their second-year project and dissertation.

DECODE worked on a news project, that involved gathering news articles from the leading local news portals published over the past two decades. The project involved extensive data gathering and cleaning tasks which allowed for the application of various data analysis techniques.

A number of industry collaboration initiatives have been established whereby various topics were researched to assist specific industry needs.

IMPACT OF RESEARCH

The team is researching various machine-learning techniques which can lead to academic publications. The outcome of said studies also benefits the undergraduate research undertaking in various manners. Additionally, programming and machine learning-related modules also benefit since the researchers can enhance the course content with research-related material and relevant content.

Through industry collaboration, the team is lending their expertise in assisting the decision-making processes and recruitment of specific companies. A number of

research projects have been initiated which were directly shaped by industry needs, and which results were communicated and supported by the companies in question.

As per RIS3 Malta's National Strategy 2021-2027, Emerging Technologies is one of the national priorities, whereby Artificial Intelligence is one of the niche areas. Through this team, the individuals are able to advance their research skills and grow their portfolio, which aids in positioning them to undertake national or European-funded projects that address said priority.

KEYWORDS

Machine Learning, Artificial Intelligence, Data Mining, Data, Optimisation

Transformative Learning in the Music Industry: An Autoethnographic Study of a Music Producer's career towards academia

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² MCAST Institute of Creative Arts

BACKGROUND

Autoethnography is a qualitative research method that involves self-reflection and personal storytelling to gain a deeper understanding of a particular phenomenon. The researcher, who is also the participant in this study, will engage in introspection and critically analyse his experiences as a music producer and educator to unfold an intricate journey of professional development. At present, the body of literature on autoethnographic studies in the music industry lacks personal narratives from individuals reflecting on their transformative experiences throughout their careers as music producers and how this ties in with the role of a music educator. While there are existing studies that touch upon related themes, they do not specifically delve into the unique insights and intersections between transformative learning experiences and the educator's role as a music producer.

OVERALL AIM

The purpose of this research is to explore the first-hand transformative learning experiences of an educator who has pursued a career as a music producer. This study seeks to understand how the educator's experiences in the music industry have influenced his understanding, knowledge, and practice of music production over the years. By adopting an autoethnographic approach, the researchers will combine personal reflections with Jack Mezirow's theoretical framework to analyse the collected data and gain deeper insights into the transformative journey of the music industry as part of the educator's professional development.

MAIN EXPECTED OUTCOME/S

To investigate the educator's career as a music producer and identify key moments or periods that have led to transformative learning experiences that have added to the professional development as an educator evolving his perspectives, beliefs, and values about music production to showcase change and growth to fellow educators wishing to embark on a journey of change.

IMPACT OF RESEARCH

To add knowledge regarding exploring evolving perspectives, beliefs, and values about music production in relation to educators' experiences in the music industry.

To contribute to the existing body of knowledge on transformative learning within the context of music production and education aiming to bridge the gap in scholarly literature.

To add to the building body of knowledge on autoethnographic methodology in research scholarly works.

KEYWORDS

Autoethnography, educator, music production, transformative learning

Teaching, Practice and Performance Strategies in Instrumental Music Teaching in Malta.

Alistair Attard

MCAST Institute of Creative Arts

BACKGROUND

The study of the instrumental music teaching strategies used by renowned professional musicians in Malta is the main theme of this research. By instrumental music teaching strategies, I am referring to the whole learning process including practice and performance strategies which, as research shows are often overlooked by instrumental music teachers (Pecen et al., 2016). This could be due to many facts such as being unaware of the literature in these areas, cultural beliefs in natural talent, practice volume, and since most instrumental music teachers are not trained in pedagogy but are chosen due to their performing abilities (Pecen et al., 2016). Being unaware of the body of literature and basic concepts in music pedagogy can lead to frustration for both teacher and student. This does not mean that teachers need to be experts in the field, but I believe that every music teacher should have a basic knowledge of the basic concepts and should be encouraged to work with multidisciplinary teams and interdisciplinary research projects and collaborations. Thus, I believe that all music teachers need to have a multidisciplinary and interdisciplinary view when teaching students of diverse ages, backgrounds, learning styles, and abilities and have a lot to learn from music psychology literature. In doing so, for example, one may become aware of certain physiological and psychological constraints and answer questions such as: why are students de-motivated and what makes them motivated to practice? and how can I help my students perform better under pressure?

Even though today the multi-disciplinarity of music is quite clear, it is only until recently that we have started to see more interdisciplinary interactions between music psychologists, educators, and musicians. This is not always easy, for each discipline has its own specialist ways of communication and these interactions are not always encouraged by the institutions.

Most of the time, instrumental music teachers rely on their opinion to teach certain techniques and there is no shared systematic pedagogy. Their opinion is usually formulated by years of experience and through various schools of thought formed by other musicians of that instrument. With these ideas in mind, I have seen the need to embark on this exploratory study of the current instrumental teaching strategies used by professional musicians in Malta.

OVERALL AIM

The aim of this research is to explore the instrumental teaching strategies used by professional musicians as communicated in their re-storied narratives. This research seeks to address the following objectives:

- 1. Consolidate the real-life experience of professional musicians, identifying the challenges they face in their effort to teach their students to become professional musicians.*
- 2. Identify the teaching strategies used to overcome these challenges and take stock of experience-based strategies and evidence-based strategies.*
- 3. Obtain insights on new strategies that can be used to overcome challenges, and which are not yet supported by significant research in the field of practice.*

As a result of the above aims and objectives, the research puzzle (question) was constructed.

- What are the experiences and narratives of instrumental music teachers in teaching their students to become professional musicians in terms of the challenges they encounter and the strategies they use in their dual role as professional musicians and teachers?*

MAIN EXPECTED OUTCOME/S

Through this study, I will be able to take stock of strategies that have been proven through scientific research, strategies which are well known in the music culture but have yet to be proven by scientific research and discover new strategies that can be used which could stem out of reflection or from existing literature. I intend to follow this research and embark on a journey to confirm experience-based practices which are still not supported by scientific research. The aim is to move from informal experience-based teaching to formal evidence-based teaching. I am constantly in touch with aspiring musicians and my aim is to continue to improve the course and expand it so that we can contribute more to Music Education in Malta.

IMPACT OF RESEARCH

This research can have a significant impact on MCAST as a vocational institution but especially in the performing arts course. It can lead to new and more specific pedagogical strategies and provide the groundwork to expand the course in the discipline of music. This work should also be of nation-wide interest and the lack of research in this area, even locally, is a strong justification to provide new insights, understanding and future actions.

KEYWORDS

Music, Teaching, Learning, Instruments, Performance

Continuous Assessment of Pollutants and Environmental Events via Satellite Data (CAPES)

Daren Scerri¹, Frankie Inguanez¹, Juan Jose Bonello²

¹MCAST Institute of Information and Communications Technology

²MCAST Institute of Applied Sciences

BACKGROUND

The purpose of this team is to be undertake research of a local and regional interest in terms of the environmental and climate impact due to pollutants and environmental events. The primary medium of research undertaken within this project is satellite data, more specifically the European Space Agency (ESA) suite of satellites, which are made up of the Meteorological Programme, the Copernicus Programme, and the Earth observation envelope Programme. Over the past few years, several collaborations with various entities have been established such as with the Environmental Resource Authority, Malta Resource Authority and Planning Authority with whom several research projects are taking place.



OVERALL AIM

We are currently assisting the Malta Resource Authority (MRA), Environmental Resources Authority (ERA) and recently the Planning Authority (PA) as ultimate beneficiaries for this research, in the use of European Space Agency (ESA) Copernicus Sentinel-2 and high-resolution MAXAR satellite data for the mapping of Land-Use and Land-Cover (LULC) and building outline segmentation over the Maltese Islands.

MAIN EXPECTED OUTCOME/S

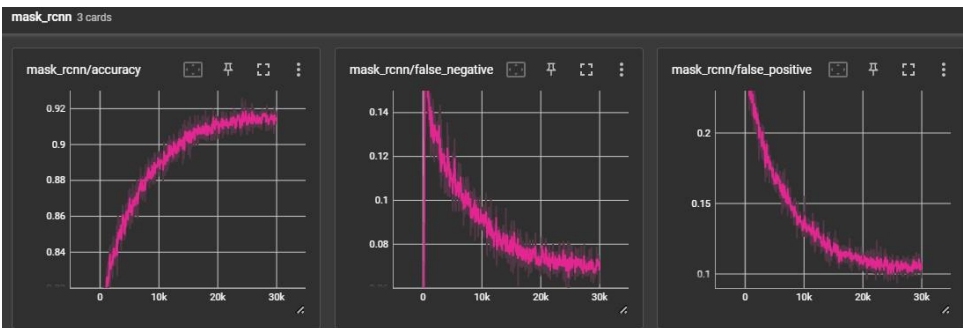
The project on land cover classification requested by the Malta Resource Authority represented by Mr Saviour Vassallo and Mr Alexander Said, led to the development of a Temporal AI model to classify land in eight classes. The requirements of this project were to provide the land cover classification change, which this year was extended to encompass up to the year 2021. This is a satellite-based study utilizing

the European Space Agency Copernicus programme, specifically the Sentinel-2 satellites.

The developing collaboration with Planning Authority (PA) expected outcome is to develop an innovative algorithm and AI model to segment building boundaries. This is a satellite-based study utilizing the Maxar Technology high-resolution images.

RESULTS

The land cover classification for the year 2021 was as follows: Cropland 48.7%, Forest 3.4%, Grassland 15.5%, Settlement 24.0%, Wetland 1.1%, Other 7.2%. The overall error rate is of 0.13% with a confidence interval/range of 0.001307 and 0.001349.



The industry standard ArcGIS Pro Deep Learning tools, have exhibited limitations in accuracy metrics (60-70%) and the ability to customize algorithms to the local context. Due to these issues and other limitations in pre-processing, tuning and post-processing both during training and inferencing, we decided to develop a more low-level solution in Python making use of the latest instance segmentation approaches, custom tiled dataset, more detailed hyperparameter tuning and our own developed innovative pre and post processing algorithms to maximise performance and refine final output.

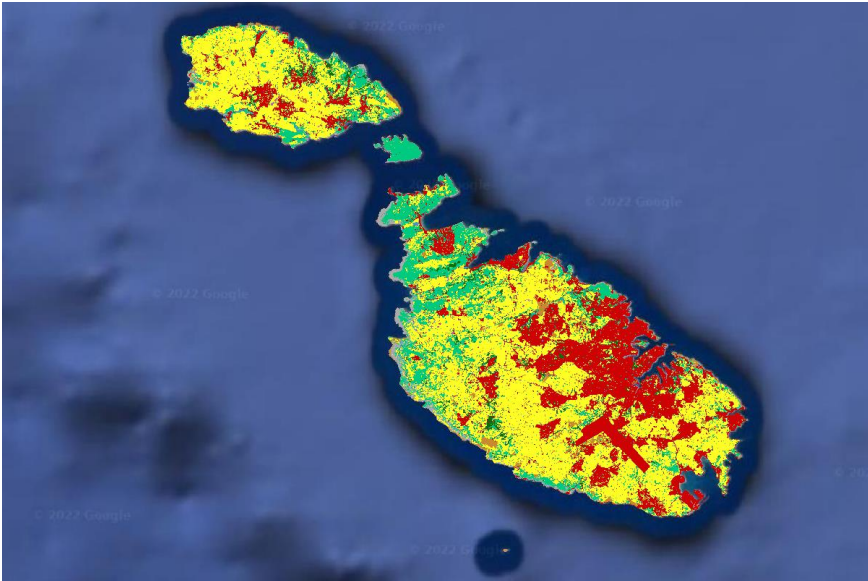
The initial training metrics achieved using a Maxar (15cm spatial resolution) harbour area dataset are very promising, with a segmentation accuracy of over 92%, with very low false negatives and false positives.

IMPACT OF RESEARCH

This mapping project with MRA is used for the purposes of national reporting of emissions and removals, from Land Use Land Change and Forestry (LULCF) activities in accordance with international and European Union obligations of Malta, and, furthermore, to provide empirical basis for policymaking by the Maltese Government, primarily via the Ministry for the Environment, Climate

Change and Planning (MECP), that enhances the sink (i.e. greenhouse gas removal) potential of the sector.

The AI exercise required by the PA to assist in the mapping of building delineations which are made available to the public via services like the map server and critical for various stakeholders.



KEYWORDS

AI, Remote Sensing, GIS, Environment Monitoring, Land Use

The Magic Potion for the Immortality of the Maltese Song: L-Aħħar Bidwi f'Wied il-Għasel.

Rene Mamo

MCAST Institute of Creative Arts

BACKGROUND

The 70s music saw a flux of great artists and bands such as Led Zeppelin, Stevie Wonder, David Bowie, and Abba to mention a few. It was a period of music expansion with new genres such as punk, reggae, heavy metal, and disco, a style which is naturally attributed to Donna Summer and Bee Gees. New bands such as Kraftwerk took advantage of the 'modern' innovation of synthesizers of that era to create new music that reflected the new technology that was creeping in very fast in the music scene.

All this helped the academic popular music community to explore and research more on musical practices, styles, and technologies. For instance, an interesting technology-related example is that of Zagorski-Thomas (2012) where he explored differences in production style between US and UK recordings in the 1970s on a macro level. On a more specific genre research level one can refer to Dyer's (1990) 'In Defence of Disco', one of the best-read essays in pop music studies, which delves into the authenticity of this genre in the 70s. A focused and specified popular song analysis one can name Feldner (2021) 'Remembering Berlin: David Bowie's Heroes' (1977).

OVERALL AIM

This study will analyse the Maltese song 'L-Aħħar Bidwi f'Wied il-Għasel' published in 1976 and will offer an interpretation of what made this song stand out among other local publications when it was released and why it is still performed and requested among the general Maltese public.

The project will take the form of a Case Study Qualitative Research Method that serves to provide an in-depth understanding of a specific subject, in this case, a song. Apart from the conventional musical analysis of structure, rhythm, and harmony, this study will offer an interpretation of the original track's timber and texture and why it stood out in the Maltese popular repertoire in the late 70's.

MAIN EXPECTED OUTCOME/S

This research is expected to shed light on reasons why this track was so popular in Malta during its release in the mid-70s considering the technological recording advances that were happening in the UK and US. It will also analyse what makes this song still so popular and requested among Maltese singers and audiences.



IMPACT OF RESEARCH

The research will serve as a continuation study of the article 'Viva Malta: National Unity, Loyalty and the Familiar in a Post-Independence Maltese Song', a study produced together with Prof. Philip Ciantar published in the Popular Music Journal (2021) by Cambridge University Press.

This project will contribute to the body of knowledge on Popular Music and Music production. It will offer further understanding and knowledge of Maltese song in the academic discourse on popular music education.

It will allow the researcher to engage in personal growth and self-development as a music producer and academic.

KEYWORDS

Popular Music Studies, 70's Music in Malta, Music Production

Unpacking the Pedagogical Potential: An Investigation into the Effectiveness of ChatGPT-Generated Lesson Plans in Modern Vocational Education

David Deguara, Daren Scerri, Gerard Said Pullicino, Thomas Gatt

MCAST Institute of Information & Communication Technology

BACKGROUND

With the growing integration of Artificial Intelligence (AI) in education, understanding its pedagogical implications has become imperative. This study addresses this need by exploring the efficacy of artificially generated lesson plans in the context of a vocational program. The research aims to evaluate the quality and comprehensibility of these AI-driven lesson plans and teachers' experiences. Associated benefits and challenges will also be identified. Data will be collected through a Grounded Theory approach, including interviews, focus group discussions, and performance evaluations. The objective is to present a holistic view of the pedagogical potential of AI in lesson planning, ultimately guiding future enhancements for AI applications in educational contexts.

OVERALL AIM

The advent of AI in education has paved the way for a re-evaluation of teaching and learning methodologies. The aim of this study is to delve into the efficacy of such AI-driven innovations, with a focus on lesson plans that are generated by Large Language Models (LLMs). To this aim, we scrutinise five lesson plans concerning a key skill subject, such as Mathematics generated by OpenAI's ChatGPT in the context of students studying for a Diploma at a vocational education and training (VET) college.

MAIN EXPECTED OUTCOME/S

Research Objectives

- 1. To assess the quality and comprehensibility of AI-generated lesson plans.*
- 2. To understand the pedagogical impact of these lesson plans on student engagement and learning outcomes.*
- 3. To evaluate teacher experiences with using artificially generated lesson plans in the classroom.*
- 4. To identify potential challenges and benefits associated with the use of artificially generated lesson plans.*



RESULTS

Preliminary results show the potential of generative Artificial Intelligence (GAI) for pedagogical purposes. However, careful auditing and validation are paramount for the effective and correct use of these tools.

IMPACT OF RESEARCH

By investigating both teacher preparation and teacher delivery perspectives, this research aims to provide a holistic view of the pedagogical implications of artificially generated lesson plans. The results of this study will not only help to evaluate the viability of implementing AI in lesson planning but also provide insights to guide future improvements in AI applications in educational contexts.

KEYWORDS

AI in Education (Aled), Generative Artificial Intelligence (GAI), Lesson Planning, Vocational Education (VET)

Why is Hydration Important in Healthcare?

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BACKGROUND

This presentation will provide insight into the findings and observations made during the ongoing research being done on local hydration practices. Although the focus of the research was initially focused on older adults and related settings, the gaps in hydration practices are noted to be wider and linked to other areas. In view of this, the presenters will highlight the gaps found in practice and how this is linked to the evidence-base. The notion that this area of practice is not highly regarded in terms of the required knowledge needed, competencies or skills is a point that the researchers are actively seeking to address. There are several points that need to be explored further here including actual hydration requirements for individuals across the life span, monitoring and observation, identifying individuals who are at risk of dehydration, documentation and handover. In addition, it is noted that hydration practices in the clinical area are frequently a delegated task with limitations in effective continuity of care and/or follow up of outcomes. The main focus here will be to create an awareness on the importance of robust hydration practices, emphasising the need to strengthen both the local evidence base and the quality of related practices linked to improving the hydration status of individuals.

OVERALL AIM

The overall aim of this project is to improve the hydration status of individuals across the life span. Various strategies are being considered and explored including health promotion, health education, accurate monitoring of hydration status and intake, continuous professional development, audits and documentation. This presentation will focus on the current activities being done in this project.

MAIN EXPECTED OUTCOME/S

Health care providers will demonstrate improved knowledge in hydration practices that is also reflected in their clinical competencies such as identifying who is at risk, assisting individuals to achieve their daily hydration requirements by implementing related skills effectively and introducing supportive tools. Delegation will also be done with the required accountability to ensure that the required action is followed up accordingly.

RESULTS



Three main themes are consistently emerging from our research with regards to hydration practices and healthcare professionals: culture of promoting fluid intake, challenges in achieving optimum hydration, hydration practices and approaches. A hydration promotion culture is evident locally within some care settings, but there is a lack of consistency in monitoring hydration and daily fluid targets which emphasizes the need for staff training and implementation of clear and accessible guidelines, policies and/or procedures in relation to hydration care within these settings. We identified that future research should focus on establishing an evidence-based approach to monitoring hydration status and identifying individuals at risk of dehydration. Difficulty in monitoring fluid intake was highlighted and we contend that this should not be overlooked in view of the multiple risks that could lead to poor health outcomes. Employing robust and rigorous methods to establish the effectiveness and implementation of innovative approaches would help in making valid contributions to the local evidence-base on hydration care in care settings. The research findings were therefore used as design parameters to create a prototype that will facilitate hydration monitoring and translate this process to an effective user experience.

IMPACT OF RESEARCH

Dehydration is consistently having a negative impact on individuals locally. The past months have seen an increased number of registered deaths indicating dehydration and/or hypothermia as the primary cause of death (Magri, 2023). Although this can be attributed to the harsh environmental conditions experienced during the summer months, the demand for increased fluid intake should be adequately addressed within different populations. The risk of increased mortality with dehydration also remains highly prevalent within hospital and institutionalised settings (Thomas et al., 2008). Furthermore, inadequate hydration levels are associated with higher risks of morbidity, including incidences of falls, urinary tract infections (UTIs), respiratory tract infections, acute confusion, constipation and delayed wound healing (Anjo et al., 2020, Szafara et al., 2012, Benelam & Wyness, 2010), placing an increased burden on healthcare services, which are already under pressure due to several contributing factors (Ministry for Health, 2022, Formosa, 2019). To mitigate preventable factors leading to dehydration our research will provide a deeper insight to healthcare professionals behaviours and approaches to hydration and interacting components leading to inadequate fluid intake. This research will extend beyond the established evidence, by providing the basis for multi-component strategies focusing on monitoring and personalised hydration interventions. This research could also help heighten awareness amongst health care professionals and service users within the

healthcare industry. This project promotes networking of different stakeholders to advance understanding of hydration practices and promotion, including interdisciplinary expertise from the health, creative arts (product design) and IT disciplines. This collaboration can help merge health information with design tools and techniques that can translate in effective user experiences to promote optimum hydration. These research activities are in line with National priorities for improving population health and well-being (Ministry for Health, 2022).

KEYWORDS

hydration practices, healthcare, knowledge, competencies, tools

Preventing Dropping Out In Post-Secondary Education Focusing On Lower-Level Courses At The MCAST Institute Of Community Services

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MCAST Institute of Community Services

BACKGROUND

Dropping out of school at post-secondary level has become an issue which is also now being highlighted by various local research studies including MCAST. This is necessary in giving insights of the possible factors leading to dropping-out of students from a course that was not imposed of them by the system but chosen freely by them.

Measuring dropouts in any one institution can be problematic at best, since aside from the fact that there different types of drop outs which can be difficult to identify, there are other issues such as students transferring to different schools, or students who leave day time courses but enrol in part time or evening courses. (Hauser and Anderson Koenig, 2011).

OVERALL AIM

This current research, which is now close to the final stage, is seeking to identify reasons/causes as to, why students at Levels 1, 2 and 3 studying at the Institute of Community Services at MCAST are dropping out, whether lecturers can identify such students at the beginning of the year and subsequently propose mitigating measures to lessen dropouts.

MAIN EXPECTED OUTCOME/S

The aims of the study include:

- *identifying students at ICS who are at risk of dropping out*
- *identifying why students continue in pursuing their studies*
- *propose a student retention framework*

RESULTS

Although this study could not speak to student drop-outs directly, it is managing to identify the factors which are encouraging students to complete their scholastic year. Therefore, one could explore difficulties faced by students during the scholastic year and deduce reason/s leading to dropping out of their peers. Furthermore, lecturers have shown to be important in this research, noticing that some could identify potential drop-outs in the first weeks of the scholastic year. While student mentors were not directly involved in the project, they were frequently mentioned by students, praising them for the continuous support.

Henceforth, the study will propose measures, based on the data collected, which will aim to lessen students dropping out from a course.

IMPACT OF RESEARCH

Reducing the figures of school dropouts from a given entity may be important when showcasing statistical figures. Nevertheless, this should be achieved since good quality education, student support and services are provided during the course duration and students can be well guided when choosing their course of studies. This research is thus very important from an education point of view and subsequently, it will translate into the betterment of the economy, society, and industries. Still, all of the latter can only be achieved if we ensure that any services provided by an educational institution aims for the personal growth and development of each student.

KEYWORDS

school dropouts, successful schooling, post secondary education

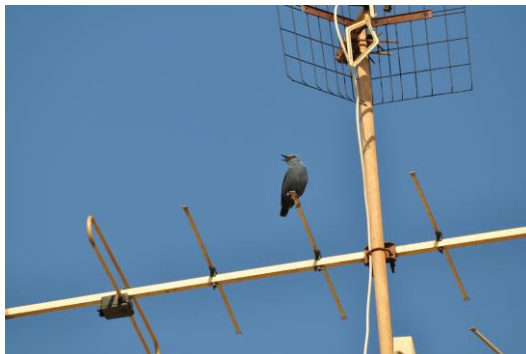
Substantial increase in urban breeding Blue Rock Thrush *Monticola solitarius* (il-Merill) in Malta.

Natalino Fenech

MCAST Institute of Creative Arts

BACKGROUND

*Although the Blue Rock Thrush, *Monticola solitarius* (Merill) is intertwined with Maltese culture in many aspects and on several levels, it is one of the least studied species of birds in the Maltese Islands, despite being the national bird for over 50 years. In the past, Blue Rock Thrushes' nests were frequently robbed so that males would be kept as songsters. This habit dates to at least the 1800s, and though illegal, it persisted until well into the 1990s. Some nests are still robbed today. The Blue Rock Thrush breeds in coastal cliffs, inland valleys, quarries, and sometimes in disused structures in the countryside. Over the past 17 years, it has been noted that several pairs started breeding in urban areas, and the population of Blue Rock Thrush in urban areas has increased steadily since then. This study found that at least 65 pairs bred in urban areas in 2022, with another 22 probably breeding. These results are significant not only because they are significantly higher than the numbers listed in the Breeding Bird Atlases of 2008 and 2018. But also because the Blue Rock Thrush is normally associated with breeding away from humans on coastal cliffs. The reasons for this increase are not yet known. It could be that the population of the species has increased and birds are seeking new breeding areas. Some of the increase in urban areas can also be the result of the loss of breeding habitat, as many quarries have been filled in with construction material over the past 15 years.*



OVERALL AIM

The study aims to continue to monitor the urban breeding population of the Blue Rock Thrush in a bid to see what the trend will be in the future. Would the urban population of this species keep increasing, stabilize, or decrease? Will there be any impact from predators such as feral cats?

MAIN EXPECTED OUTCOME/S

The main expected outcomes are 1. To identify new breeding species in urban habitats. 2. To monitor whether existing pairs keep breeding in the same areas 3. To try to conform areas where breeding was listed as 'probable'. 4. To see whether offspring colonize nearby areas, thus expanding its population. 5. To study the impacts of predators, especially on offspring that can barely fly when they fledge. 6. To try to involve more people from other locations to take part in the study. 7. To try to identify what the birds are feeding on. 7 to try to identify how many offspring are raised by each pair at each breeding site.

RESULTS

Through fieldwork and several other sites identified through a small citizen science project asking people to list sightings in their areas on a Facebook group related to birds, during the 2022 breeding season, a total of 65 confirmed breeding pairs were noted in urban and industrial areas in Malta. This is more than nine times more than the confirmed breeding in the 2018 Breeding Bird Atlas. The number of probable breeding sites found is 22 more than the Breeding Bird Atlas. These numbers are significant because they represent the new pairs that have been identified represent an increase of between 16 to 28 % of the known population of Blue Rock Thrush.

IMPACT OF RESEARCH

The research is in the field of ornithology and can have several impacts. The first impact is on the species itself. Although not an endangered species and a lot of people have heard about il-Merill, few have ever seen it. Showing people it is breeding in their locality gives them ownership. Ownership helps in the protection of the species. Birds are part of an ecosystem, and such species may be feeding in people's front or back gardens on rooftops and maybe eating insects such as Coleoptera that can be harmful to people's plants and gardens.

Student-Researchers as Co-constructors of the PE Curriculum - Study Protocol

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² University of Birmingham - School of Sport, Exercise and Rehabilitation Sciences

BACKGROUND

Participatory research used within an educational setting with students fulfils what is now being referred to as the new sociology of childhood. This approach values students' voices and inclusion as it allows students to engage as researchers in the identification of concerns and needs, and in the construction of effective practices.

OVERALL AIM

The purpose of this presentation is to present a protocol of a project aimed at implementing a participatory research approach with a group of 15-year-old PE students-as-researchers focusing on PE for wellbeing. The project has two main aims: i. to explore whether and how PE provision within schools can be reimaged to promote wellbeing for all students, and ii. to examine the feasibility of a novel participatory research approach, where students co-construct their educational experience with their teachers.

MAIN EXPECTED OUTCOME/S

This study aims to identify how feasible it is to engage Year 10 Maltese student-researchers, in first the planning of a research exploring the perception of how PE influences adolescents' wellbeing, and subsequently, co-construct with the main researcher a set of PE lessons, with wellbeing as the main outcome. Post-intervention dual evaluation will be carried out to understand the student-researchers opinion about the effectiveness of the participatory approach, about the novel way of presenting PE for wellbeing and to decide ways of findings' dissemination.

RESULTS

This project is an ongoing trial and error project within all phases, in which student-voices will be heard about not only PE content decisions but also about preferred pedagogical practices leading to a more meaningful, wellbeing PE experience.

IMPACT OF RESEARCH

The way students will be co-constructors and co-researchers, leading them to be empowered in a project aimed at bringing about change, is one of the main strengths of this study. The student-researchers will assume the role of respondents in the initial phase of the study, but then they will become co-

researchers in the subsequent phases. Finally, we want the student-researchers to feel as co-owners of the research and allow the students themselves to disseminate the results towards change and improvement.

Planning beforehand for a participatory approach requires two main factors: choosing the right approaches and creating an approachable environment. The intervention will take place within the school context and during actual PE lessons so that the student-researchers will feel safe to express their actions, confidences and opinions, even if they might result in conflict with those of others.

On the other hand, the approaches and tools to be chosen especially for the first part of the study, must be the key for students to understand their role in the study and immerse themselves as collaborators of the study. Strategies which are multi-method, such as the Mosaic approach (Clark and Moss, 2001) or which adopt a cycle of action and reflection (Wadsworth, 1997) are considered ideal in listening, understanding and appreciating the voices of students, making them feel owners of their own learning.

KEYWORDS

participatory research, student-researchers, wellbeing, physical education



Childhood obesity in the Mediterranean Islands

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BACKGROUND

Childhood obesity is a complex public health problem worldwide which imposes a financial burden on states. A study incorporating seventeen Mediterranean countries indicated higher rates of obesity when compared to central and northern European countries. Moreover, evidence hinted that this could also be said for isolated populations specifically located in the Mediterranean Sea. This comes with the fact that although the Mediterranean diet is known for its benefits to health, evidence shows a regressive shift towards the Western dietary patterns, which are considered unhealthy and potentially cause weight gain, among other cardiovascular health problems.

OVERALL AIM

Considering that literature is dispersed and the noted risk factors remain inconclusive, this narrative review aims to contribute to the 'missing gap' of information by compiling and analysing literature on the possible risk factors which are associated with childhood obesity in Mediterranean islands. The aims and objectives are

- To construct a search strategy and identify papers that are relevant to the topic*
- To examine the prevalence of childhood obesity in the whole Mediterranean island population*
- To identify the risk factors associated with childhood obesity in Mediterranean islands*
- To critically assess, synthesize and evaluate the evidence in order to provide future research priorities or policy recommendations.*

MAIN EXPECTED OUTCOME/S

Searches were performed on four online databases for epidemiological observational studies, which adhered to an inclusion and exclusion criteria. Only articles discussing potential risk factors for childhood obesity in Mediterranean islands in any age group were included. Studies which weren't carried out specifically in isolated Mediterranean countries, no risk factors for childhood obesity, and participants whom were unhealthy are being excluded. A quality appraisal tool is being utilised to assess and critically appraise methodological rigour of the studies eligible for inclusion.

RESULTS

A total of twenty-seven studies were included through which the quality of methodology was rated on the quality assessment score from 1-10. Following Dahlgren and Whitehead's model of health (1991) as guidelines, risk factors reporting positive associations for childhood obesity were found to be behavioural, environmental, genetic and social.

IMPACT OF RESEARCH

This review will bring to light the myriad of risk factors of childhood obesity in Mediterranean islands. The information found was aggregated together, analysed and discussed and the strengths, limitations and recommendations were also highlighted to put further insight to investigate the matter further. This review concluded that there are a number of risk factors in Mediterranean island populations which all contribute to high obesity percentages in all age groups and particularly among the elderly. These results could thus be utilised for the consideration of implementing policies on a national level, such as financial incentives from the government children to participate in any form of physical activity, implement school-based health education programmes, varying from adopting a nutritious diet and healthy lifestyle practices. In the research field, this paper will help 'fill in' the missing gap of research which encompasses the risk factors of childhood obesity in the Mediterranean Islands. For the curriculum, highlighting aspects which make our environment obesogenic could help design and embed notions of combatting such risk factors which contribute to childhood obesity. For national priorities, obesity costed Malta €36 million in 2016. These figures have been rising steadily ever since, piling further pressure on healthcare costs and eventually the government's expenditures. For global priorities, this paper could serve as a point of reference to understand how islands in the same geographical basin can share same risk factors where strategies could be shared and disseminated accordingly for effective childhood obesity prevention and management.

KEYWORDS

Childhood obesity, Mediterranean islands, risk factors

Documenting Maltese Illustration - An Observational and Exploratory Analysis of Common Themes, Potentials, and Challenges in Contemporary Maltese Illustration - Mural and Visual Research

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BACKGROUND

Illustration in Malta has never been properly documented due to several reasons. Even though illustration is an ancient art-form, it has always been quite a niche medium, never knowing where it properly sits, whether it's in fine art or graphic design. Nowadays illustration is more defined and stronger to stand on its own. With many local illustrators working independently in Malta and abroad across a variety of sectors, it's essential that the medium is documented. This is being done internationally mainly through AOI (Association of Illustrators), however, nothing of the sort is being done locally. Throughout this research, we intend to keep looking at the history of Maltese



Illustration, present circumstances, and examples, and examine what the future of the medium might look like. We should also continue investigating how the rapidly ever-changing landscape of the island is reflecting on the medium and how it affects the process and the results.

OVERALL AIM

One of the goals of this project is to adapt our study into an illustrated publication. As a visual researcher, my primary function is to select images that support the concepts discussed in the 20,000 research paper. Some illustrations must be directly sourced from the archives of artists referenced in the paper. Notably, specific artworks from these collections have yet to be seen in public dissemination and are absent from online databases or other publications. Thus, compiling and documenting such source material will offer significant value to both this study and the broad discipline of illustration. I am presently contacting artists to request from them appropriate visuals.

The research conducted for this paper has revealed the significance of illustration as an agent of transformation, prompting the execution of a mural aimed at inspiring and driving social activism. The paper concludes that we need more similar artistic projects that bring communities together to address important issues and influence community improvement through united participation and dedication to causes.

MAIN EXPECTED OUTCOME/S

During the upcoming conference, I aim to share select images integrated into my presentation and discuss their relation to our investigation. The inclusion of visual components obtained directly from primary sources has the potential to enhance the interpretation and spreading of knowledge derived from this research project.

Furthermore, the visual documentation of the mural's developmental process, captured in the attached photos, will be discussed. A blog post on the MCOI website will explore how illustration can serve as an impactful instrument of activism. By sharing the documentation, the post explores how illustration effectively conveys messages promoting social change and raising awareness.



RESULTS

The mural, to be showcased during the launching of the MCOI Annual at the Malta Book Festival 2023, will occupy a 6-meter by 2-meter wall behind the Malta Arts Council stand.

To facilitate the creation of the mural, Arts Council Malta and the National Book Council will provide an unlaminated PVC board and necessary materials such as paint, brushes, and pens. The choice of specific media to be used in the mural will be determined through discussions and brainstorming sessions among project members and the director Matthew Demarco from Bloom. This collaborative endeavour will involve professional illustrators as well as participation from the public.



My primary role in this project is to visually document the mural's development, capturing the artists and participants in action.

IMPACT OF RESEARCH

This approach aims to maximize outreach and accessibility, as both the blog post and the mural itself are designed to transcend the boundaries of traditional art spaces such as galleries, enabling exposure to a broader audience.

Exhibiting thought-provoking works in public spaces allows artists to engage with



broader audiences and communities in respectful discussions. When combined with educational activities, art can empower people from all backgrounds to find their voice and express themselves on issues that affect them.

Engaging younger people in art about current events can help them learn to be involved citizens and think critically at a young age. Illustration uses visual creativity to show complex ideas in a way that people from different backgrounds can understand. In this way, art serves as both a problem-solving tool and a bridge-building tool, effectively conveying multifaceted viewpoints in a manner that invites thought and creativity.

KEYWORDS

Nowadays illustration, Local industry, Association of Illustrators, Graphic Design, Visual Documentation, Mural, Public

The motivating factors

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BACKGROUND

Taking the leap into female entrepreneurship: The motivating factors of educators investing in small businesses in Malta.

OVERALL AIM

It is widely known that a number of educators in Malta become entrepreneurs by investing in small businesses. The scope of this research focuses on acquiring knowledge about the motivating factors that encourage female educators to become entrepreneurs of small businesses.

MAIN EXPECTED OUTCOME/S

The researcher intends to highlight the motivating factors that may lead female educators to take the leap into entrepreneurship. The researcher intends to address the following research question and research objectives.

Which are the motivating factors and challenges encountered by female educators when taking the leap into entrepreneurship?

- *To appraise the motivating factors and challenges that female educators experience when setting up small businesses in Malta.*
- *To critically evaluate the existing support measures and incentives which support female educators as entrepreneurs when operating in Malta.*
- *To recommend ways how female educators who are also entrepreneurs may enhance their operational activities when managing small businesses in Malta.*

RESULTS

The preliminary results of this ongoing research indicate that these female educators love their full-time job. They consider their full-time job as educators as a mission that they wish to accomplish and continue. Results show a variety of motivating factors for these female educators to take the leap into entrepreneurship. The prevalent motivating factors indicate the wish to follow a dream, which they know may not render much financially, yet it allows them to express their creativity, to chase dreams, to follow their passions, and to start new beginnings, even on a personal basis. Results show that very often for these participants it is not the financial return that is a priority but to follow a dream. They put so much passion into their ventures that gives them a sense of satisfaction and accomplishment that nothing may compare to it. Results show that there is a



strong need of enterprise education and different forms of support for these female entrepreneurs in order to make their business venture successful. These forms of support include emotional, social and financial support.

IMPACT OF RESEARCH

Entrepreneurship in itself is considered to be a way of alleviating poverty. Female entrepreneurship is considered as generating employment, financial activity and female empowerment. It is envisaged that this research will provide contributions to research on female entrepreneurship, the education system, as well as provide a valid contribution towards the economy and finance. It is highly recommended that entrepreneurship education is included in the curriculum. Importance should be given to financial literacy and female entrepreneurship as from early years education.

KEYWORDS

Female entrepreneurship, educators, motivating factors, entrepreneurship education

**MCAST
RESEARCH & INNOVATION
EXPO 23**

***A SELECTION OF ONGOING
EXTERNALLY FUNDED PROJECTS***



MCAST

EXTERNALLY FUNDED PROJECTS – ONGOING

Exploration and Implementation of Products with Alternative Proteins in Mediterranean Region

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MCAST Institute of Applied Sciences

BACKGROUND

Proteins obtained from alternative sources such as plants, microorganisms, and insects have attracted considerable interest in the formulation of new food products that have a lower environmental footprint and offer means to feed a growing world population. In contrast to many established proteins such as meat dairy, soy and pea, much less information is available on alternative proteins. In particular, key techno-functional properties, such as solubility, emulsification/foaming and gelation properties are highly dependent on the extraction type and their large-scale commercial processes build a high complex matrix to solve. After all, compositional, structural, and functional properties of alternative proteins determine their final usage in products and their nutritive, anti-nutritive properties.

OVERALL AIM

The objective of ProxIMed is to introduce proteins from sustainable sources into the Mediterranean (Med) food and feed systems to promote and establish the use of alternative (alt-) proteins. Traditional alternative protein sources mainly of plant origin (lentil, faba bean (which are common in MedDiet), and chia seeds (a novel seed source introduced to the Med food chain with the recent consumer trends), protein sources defined as "Novel food" (micro-algae, insects, mycoprotein, tomato and mallow leaves, duckweed) and agro-industrial by-products (tomato pomace, sesame cake, date cake) are selected for this purpose. Proteins will be produced by using innovative and green processing technologies aiming minimal impact on nutrients and will be implemented into final products that will be adapted and introduced to Mediterranean consumers in different regions (Middle East, Northern Africa and Europe). Novel processes and the protein value chain will be assessed for environmental, economic and social impacts

MAIN EXPECTED OUTCOME/S

The protein hydrolysates and protein extracts will also be tested by MCAST for potential cytotoxic effects against human colon adenocarcinoma (Caco-2 cell or

HT29 cells). Testing of antinutritional factors will also be extended to the quantification of non-polymeric phenolic compounds using HPLC and polymeric phenolic compounds including tannins and saponins will be determined spectroscopically. The quantification of total phenolic content, total flavonoid and ortho diphenolic content will be carried out spectrophotometrically whilst the antioxidant activity of protein samples will be determined using the 1,1-diphenyl-2-picryl-hydrazyl (DPPH) method. The quantification of trypsin inhibitors namely phytic acid (phytate content) will be determined using ELISA kits. The presence of potential enzyme inhibitors including heavy metals (Pb, Cd, Cu, Fe, Cr, Sr and Ni) will be determined using atomic absorption spectroscopy.

IMPACT OF RESEARCH

ProxiMed will gain solid knowledge about consumer's acceptance and choices towards to alt-protein products that will directly be implemented into the product development.

- Innovative and "green" technologies will be utilized that affect nutritional quality minimally and their performance on protein and product quality will be clearly defined and SDG 3, Good health and well-being will be sustained.
- ProxiMed will develop products based on consumers' choices and environmental assessment of technologies and produce these products directly by involved industry partners.
- Economic and environmental assessment of the promising technologies will guarantee to create a guideline for selection of suitable products with right technologies driven from consumers' choices. Additionally, hotspots can be identified for respective impact categories as well as suggestion for measures for improvement can be derived.
- Use of alt-sources for protein rich food products will improve the accessibility towards sustainable products and enable a better balance in food imports dependency.

KEYWORDS

Alternative Protein, Anti-nutritional factors

This project is part of the PRIMA Programme supported by the European Union



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A Satellite Damage Sensor

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BACKGROUND

In this project, further work is being carried out on the development of a smart sensor for satellite shields. The sensor will be able to detect impacts, locate and quantify damage on the satellite shield, and estimate the speed of the space debris that damages the shield. In recent years, the satellite market experienced a paradigm shift with the rise of small satellites and constellations formed by hundreds of satellites. It is anticipated that by 2026, more than 300 satellites per year will be launched, representing a market of \$304 billion. However, the increase in satellite density in orbit and the large amount of space debris orbiting in space poses a threat to such satellites.

Space debris is any man-made object in orbit that no longer has a useful purpose, and can be classified in three categories according to size: smaller than 1 mm, between 1mm – 10mm, or larger than 10 mm. This debris poses a threat because it can collide with satellites that are still operational and may thus disrupt satellite-dependent services such as telecommunications and satellite navigation systems. Debris larger than 10 mm can be detected by radars and optical sensors, and thus, satellites in its path would be able to take evasive manoeuvres. On the other side of the spectrum, debris smaller than 1mm is addressed by satellite shields that are designed to withstand its impact. Therefore, this is no real danger to orbiting satellites. However, space debris between 1mm and 10 mm in low Earth orbit (where velocities are over 5 km/s) poses a threat to orbiting satellites as it is too small to be detected by in-situ technologies and contains enough kinetic energy to damage the satellite shield.

OVERALL AIM

A previous study introduced a smart surface technology with resistive tracks to detect and locate damage caused by space debris. However, the technology had limitations in accurately determining small damaged areas and providing information about the space debris itself. The present project aims to enhance the sensor by reducing the size and pitch of the tracks, improving its performance. Additionally, a new feature was developed to estimate the speed of the impacting space debris. The upgraded sensor will be evaluated using a light-gas gun to simulate high-velocity impacts in space, ensuring the effectiveness of the proposed solution.

MAIN EXPECTED OUTCOME/S

The developed sensor is expected to produce an image which shows the region where the damage occurred. Since the track width has been reduced to 0.5mm, the determined shape and location of the damage are expected to be more accurate than those of previous work. The sensor is also expected to be able to estimate the speed of the space debris that damages the satellite. This feature has already been developed but it still has to be evaluated using a light-gas gun.

IMPACT OF RESEARCH

Continuous research efforts aim to understand the behaviour of the shields under hyper velocity impacts through the use of characterisation experiments which produce iterative improvements in shield design. While traditional material testing achieves a pass or no pass criteria, there is a significant requirement to detect impacts and quantify the level of damage following an impact. Such awareness is important to establish if the satellite needs to be repaired or replaced.

KEYWORDS

Space, debris, satellite, sensor, damage

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The Malta Council for
Science & Technology



Tools For T

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BACKGROUND

Every democratic society must ensure that its citizens are well equipped with citizenship skills, a task which is especially trusted to educators to teach character and moral education to the future generation (Althof and Berkowitz, 2006). One definition of citizenship (civics) education was developed by Kerr (1999) who believes that it is a broad term that refers to the preparation of young people for their roles and responsibilities as future citizens.

Despite the need to equip students, according to Paul, Elder and Bartell (1997) educators have limited knowledge of thinking skills. Such a statement is also made by Stapleton (2011) who believes that certain educators lack basic knowledge or understanding of these critical thinking skills. These conclusions are worrying, especially considering Abrami et al.'s (2008) conclusions who believe that there is potential for students to be equipped with such skills if educators are provided adequate training about such skill sets.

The Tools for T project aims at bridging this gap by providing a set of educational resources aimed at developing T shaped professionals.

What is a T shaped professional?

A "T-shaped professional" is a concept that describes an individual's skill set and expertise. The idea behind the T-shaped professional is that they possess a combination of both deep expertise in a specific area (the vertical bar of the "T") and a broad range of skills and knowledge in related or complementary fields (the horizontal bar of the "T"), including the capacity to work effectively in interdisciplinary or cross-functional teams.

T-shaped professionals are valued in many industries and organizations because they can combine their specialized knowledge with a broader skill set, which often makes them more adaptable and effective problem solvers since they can bridge gaps between different areas of expertise and foster innovation by drawing from various domains to address complex challenges.



Hence, research on becoming a T-shaped professional is essential because it not only clarifies the concept but also provides insights into the practical benefits, impacts, and strategies associated with this approach to professional development. It helps individuals, organizations, and society as a whole adapt to the evolving demands of the modern workforce.

OVERALL AIM

The overall objective of the Tools for T partnership is to develop a database accessible via an online platform for both educators and students to help them in their educational journey by developing their T shaped professional skills. This project is based on the



sustainable development goals (SDGs), since they provide a framework for addressing some of the main challenges faced worldwide such as climate change and inequality. Hence, The Tools for T project aims at integrating these SDGs goals within educational material that will ultimately help to empower educators and students alike into becoming more active citizens.

Website Link: <https://www.tools4t.eu/>

MAIN EXPECTED OUTCOME/S

The project stages can be summarized as work package one (WP1), which constitutes the main research phase, and the current ongoing work package two (WP2) as follows :

WP1: Secondary market research was undertaken by all the project partners related to the skills necessary to become a T shaped professional, and what the terminology itself entails. Following this, primary market research involving semi-structured interviews targeting both VET educators and students, was undertaken to compare and contrast one's understanding of the topic and to identify which skills are required in today's workforce.

WP2: The data generated by the various project partners from phase 1 was collated and analysed by the project leader, Frida College, which resulted in the emergence of the following themes: Vital Citizenship, Identity and Culture, Social Citizenship and Inclusion, International Experience and Technological Change

RESULTS

This research conducted a two-pronged investigation, consisting of a comprehensive review of the existing literature regarding the integration of citizenship skills within students' education, together with an empirical analysis of stakeholders' perceptions concerning the integration of such skills within the educational framework. The synthesis of past studies on the subject evaluated the merits and demerit aspects of the various strategies available to embed citizenship skills within the course, ranging from the design of stand-alone units dealing with the subject to the infusion of such skills within each unit in the delivery of the lectures, collaborative work performed during the lesson, as well as the design of the assessments.



In addition to such a literature review, findings from the one-to-one interviews with lecturers have underscored the challenges they face in implementing these skills within their unit, despite their efforts and commitments to integrate these skills given their importance in today's dynamic market. The disseminated results confirm lecturers' steadfast believe on the importance of citizenship skills to meet the needs of the 21st century employer, however there are also challenges on how best to embed them in their teaching methods and assessment protocols. To triangulate the process, the views of Vocational Education and Training students was collected who have affirmed the importance of integrating citizenship skills in every academic unit, rather than having a stand alone subject. Nevertheless, students have also attributed the acquisition of citizenship skills beyond the classroom, during their participation in apprenticeship programmes, which equipped them with the practical know-how for a successful transition into the workforce.

IMPACT OF RESEARCH

Due to it's extensive field of research, the Tools for T project has the potential of having an impact within the following settings:

- Becoming a T-shaped professional enhances innovation because these individuals can draw on knowledge and skills from various areas to solve complex problems. Furthermore, by utilizing the innovative outputs of this project, educators have the potential of enhancing student engagement which is directly linked to reduced absenteeism and drop out rates.*

- *Since industries are constantly evolving, T-shaped professionals are better equipped to adapt to these changes because their broad knowledge base makes it easier for them to pivot and learn new skills when necessary. Hence this research aids current and future workforce to develop their skillset.*
- *Educators and students alike can advocate for a more well-rounded curriculum that encourages students to develop a wide range of skills and knowledge, through the appropriate use of technology, such as VR.*

In conclusion, becoming a T-shaped professional has the potential to positively impact both the industry and society. The ability to combine deep expertise with a wide skill set makes individuals more versatile, creative, and adaptable, contributing to the growth and betterment of various sectors and the broader community.

KEYWORDS

T shaped professional, transversal skills, VET, educational resources, SDGs.



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Bioactive compounds extracted from Olive mill waste

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BACKGROUND

Olive oil is the most important food item of Mediterranean Diet. Major olive oil production takes place in Mediterranean countries. During the production of olive oil, significant amount of waste is generated in the form of pomace and waste water depending on the production method. In this project, we will focus on the valorization of olive pomace for the purpose of production bioactives and nanocrystalline cellulose. Olive Pomace will be used to produce functional ingredients showing 'antioxidant, anticancer' activity and also nanocrystalline cellulose that can be used as an anticaking agent. Pomace bioactives will be extracted via various 'green' technologies (supercritical fluid and ultrasound) and will be encapsulated afterwards to produce liposomes to increase their bioavailability. A comprehensive analysis on the nutraceutical properties of the extracts and capsules will be performed. At the same time the remnants left from extraction will be utilized to produce nanocrystalline cellulose which would be proposed as an anticaking agent. High pressure homogenization and ultrasonication will be applied at that stage. To our knowledge there is a not previous research that considered all these aspects for olive pomace valorization at the same time with the proposed technologies.

OVERALL AIM

Olive oil is an indispensable component of the Mediterranean dishes. More than 90% of olive oil is produced in Mediterranean countries and ~82% of table olive is also produced here¹. Turkey is an important olive and olive oil producer thus significant amount of waste is generated during the production. OpoBiCell will directly be addressing the olive value chain by valorizing olive pomace. OpoBiCell is directly related with the call since the product of interest is strongly associated with Mediterranean countries and will also provide outputs for the Mediterranean agro-food value chains. Innovative technologies and strategies will be utilized to obtain value added products from olive pomace. Maltese team will focus on a detailed characterization of olive pomace extracts produced by different techniques (conventional solvent, ultrasound, supercritical fluid extraction) from a health perspective.

MAIN EXPECTED OUTCOME/S

OPoBiCell will produce ingredients that will attract the attention of food manufacturers. The project outputs have significant potential to be commercialized after conducting a careful cost analysis. In terms of local producers, their waste will be more valuable than before. The project will also be an initiative for future collaborations in Horizon Europe and PRIMA grants. Researchers will be educated and results will be shared in international event. Scientific publications will be another impact of the consortium.

IMPACT OF RESEARCH

The aim of OPoBiCell is to utilize the olive pomace generated from olive oil processing with maximum efficiency to produce bioactives by using different extraction methods and to utilize the remaining pulpy biomass to produce nanocrystalline cellulose as an anticaking agent. Under this scope, the specific objectives of the project are listed as:

- 1) To use different extraction methods (supercritical fluid, and ultrasound) for the recovery of bioactive constituents from olive pomace and make a comparison based on antioxidant activity, yield and phenolics content (METU Team).*
- 2) To perform physicochemical characterization of the olive mill waste extracts using a profiling-based approach for the quantification of the major bioactive classes present in the extracts (Maltese Team).*
- 3) To determine the bioactive potential of the extracts against the human and mammalian cancer cell lines and their effect on the cell cycle (Maltese Team).*
- 4) To encapsulate various fractions and crude extracts and test the delivery of these compounds on a cellular level (Maltese Team).*
- 5) To make an assessment and quantification of Nuclear Factor kappa transcription factor, tumor suppressor p53 protein and apoptosis regulator BAX protein and caspase-3 (Maltese Team).*
- 6) To produce nanocrystalline cellulose (NCC) from the waste remaining following extraction (METU Team).*
- 7) To perform physicochemical characterization of the NCC (METU Team).*
- 8) To test NCC as an anticaking agent (METU Team).*
- 9) To educate researchers and cooperation people from both teams (All).*
- 10) To strengthen the collaboration between Maltese and Turkish partners for further projects under PRIMA or Horizon Europe (All).*
- 11) To foster knowledge transfer between different institutions (All)*
- 12) To publish the project outputs as scientific paper/make presentations in conferences.*



KEYWORDS

Polyphenols, olive, waste



Project OpoBiCell funded by the Malta Council for Science and Technology and the Scientific Technological Research Council of Turkey (TÜBİTAK) through the MCST-TÜBİTAK 2021 Joint Call for R&I projects. This initiative is part of the PRIMA Programme supported by the European Union under grant agreement number MCST-TUBITAK-2021-04.



The Malta Council for
Science & Technology

UNified framework to cope with droughts under MEDiterranean climate change conditions (UNIMED)

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BACKGROUND

Enhanced by climate change, droughts became more frequent and more severe in the last decades. Thus, the assessment on water resources, supply vulnerability, estimation of water scarcity and analyses of droughts has become increasingly more relevant. The assessment of drought effects is usually in the scope of a region and sometimes a country. Particularly during the last two decades, an abundance of indicators has been developed to assess droughts. At the same, literature attests that recent drought related research has revealed inter-relationships not only between climate change and its effect on the severity of droughts, but also on the increased vulnerability of the agricultural sector to cope with droughts.



OVERALL AIM

The overall aim of the project is to come up with a unified, indicator based, framework to better assess, adapt and ultimately cope with agricultural droughts under Mediterranean climate change conditions. The resulting Survivability-of-Droughts Index (SDI) will derive from a quantification of four underlying indices, i.e., perception, vulnerability, adaptability and recoverability. Each of these indices will draw on a mutually exclusive set of relevant economic, social and environmental indicators, ensuring that the assessment framework is aligned with the Water-Energy-Food-Ecosystem (WEFE) Nexus approach. The WEFE Nexus approach integrates management and governance across the multiple sectors of Water, Energy, Food, and Ecosystems. The approach is aimed at providing

quantitative evidence on economic, environmental and social aspects of water governance.

MAIN EXPECTED OUTCOME/S

Our overall aim is to come up with a unified, indicator based, framework to better assess, adapt and ultimately cope with agricultural droughts under Mediterranean climate change conditions. The research will go beyond the currently available drought assessment and monitoring approaches to also include the aspects of the adaptability to cope with oncoming droughts and the recoverability of the agricultural sector in the aftermath of a severe drought. Moreover, the proposed assessment framework will consider the degree of preparedness for droughts on the part of farmers through a perception index. Together, these four aspects will constitute the underlying indices which make up the overall Survivability-of-Droughts Index aimed at developing a framework to support the robust assessment and monitoring of droughts affecting the agricultural sector. Its application will be at the river basin scale in Turkey and at the country scale in Malta.

RESULTS

The project will bring in practical guidelines addressed to farmers of how to better assess, adapt and ultimately cope with the impacts of droughts under Mediterranean climate change conditions. The project aims at developing a Survivability-of-Droughts Index made up of four indices -the Perception Index Vulnerability Index Adaptability Index Recoverability Index. The perception index unveils the perception of the local agricultural community towards drought. The Vulnerability Index measures the degree of vulnerability of local farmers to droughts. The Adaptability Index measures how able farmers are to adapt to situations of drought. The Recoverability index aims at measuring the ability of farmers to recover from a drought.

IMPACT OF RESEARCH

The development of a Survivability-of-Droughts Index in the context of the Water-Energy-Food-Environment (WEFE) Nexus, is a novel concept in the scientific domain of coping with droughts under changing climate conditions. The index will help local farmers to cope with droughts. The recommendations made at the end addressed to policy-makers will aid their decision-making process. Moreover, the adoption of the WEFE NEXUS concept will ensure that the assessment framework is fully aligned with recently issued EU policies and planning strategies, such as the upcoming Common Agricultural Policy (New CAP 2023-2027), the Farm to Fork Strategy which is at the heart of the EU Green Deal aiming to make food systems

fair, healthy and environmentally-friendly, and is underpinned by the Circular Economy Action Plan which is perceived as a prerequisite to achieve the EU's 2050 climate neutrality, and which attributes a high circularity potential to food-water-nutrients. . The 'adaptability index' will bring a means to measure in a quantitative manner the level of uptake of good practices and approaches on the Island of Malta and in the Izmir, Menemen region of Turkey, as case studies. The survivability-of-drought index could be adopted in other regions particularly those having similar climate conditions to Malta and Greece. The project will contribute towards collaboration in the area of water management between Malta and Turkey.

KEYWORDS

Droughts in agriculture, Water Management, Climate change, Survivability-of-Droughts Index



Project UNIMED funded by the Malta Council for Science and Technology and the Scientific Technological Research Council of Turkey (TÜBİTAK) through the MCST-TÜBİTAK 2022 Joint Call for R&I projects. This initiative is part of the PRIMA Programme supported by the European Union under grant agreement number MCST-TUBİTAK-2022-04.



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Obstacle Avoidance in the SmartPol Project

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BACKGROUND

The SMARTPOL project aims to develop a novel and compact pollution detection, monitoring and analysis system that utilizes a combination of hardware and software components to detect and monitor various types of marine pollution. This system will be designed to be deployed in marine fields and will consist of a Shore Control Centre and Unmanned Surface Vessels (USVs) that are equipped with multi-sensor technology and AI-based solutions.



Somes tasks of the project focus on the development of an autonomous navigation module that can accurately and safely navigate the USVs. To achieve this, the module must have the capability to detect and track obstacles in the vessel's path. The ability to detect and track obstacles is crucial for the safe and efficient navigation of the USVs, as well as for avoiding collisions with other vessels and marine structures.

OVERALL AIM

The aim of the research was to develop an obstacle avoidance system for SmartPol. In order to achieve this aim, the main objectives were to select the most suitable sensors for the task, to develop algorithms to detect and avoid obstacles, and to evaluate the developed technology.

MAIN EXPECTED OUTCOME/S

The expected outcome was to have a fully functional obstacle avoidance system that could be used for the SmartPol's USV.

RESULTS

As of the current stage of the SMARTPOL project, no testing has been carried out for the obstacle avoidance system. The research is in the design phase, and

comprehensive testing is yet to be conducted to evaluate the functionality and efficacy of the developed technology.

Upon completion of the testing phase, the research anticipates the successful implementation of a fully functional obstacle avoidance system tailored for the SMARTPOL USVs. The expected results include the system's ability to accurately detect and track obstacles in the vessel's path, ensuring safe and efficient navigation. This outcome aligns with the overarching aim of the research, which is to develop an advanced obstacle avoidance system for SMARTPOL.

While the testing phase is pending, the anticipated results include the validation of selected sensors for obstacle detection, the successful functioning of algorithms designed for obstacle avoidance, and an overall positive evaluation of the technology's capability to enhance the safety and performance of the SMARTPOL USVs.

As the testing phase progresses, the research team aims to gather empirical evidence to support the effectiveness of the obstacle avoidance system. These expected results will form the basis for further refinement and optimization of the technology, contributing to the overall success of the SMARTPOL project in advancing marine pollution detection and monitoring capabilities.

IMPACT OF RESEARCH

In the realm of scientific exploration, the integration of cutting-edge obstacle detection technologies into the design of a novel Unmanned Surface Vessel (USV) stands as a pioneering contribution to the scientific field of autonomous marine systems. This innovative approach not only addresses current challenges but also establishes a foundation for future research endeavours, shaping the trajectory of advancements in marine technology.

Shifting focus to the economic landscape, the incorporation of state-of-the-art obstacle detection technologies into the new vessel design extends benefits beyond safety. This innovation has the potential to not only enhance safety but also introduce economic benefits, potentially creating new markets and opportunities within the marine industry. This, in turn, fosters economic growth and development as the innovative vessel introduces efficiency and reliability.

On the societal front, the introduction of this groundbreaking vessel, equipped with advanced obstacle detection capabilities, aligns seamlessly with societal expectations for sustainable and technologically advanced solutions. This development contributes not only to public confidence in environmentally conscious initiatives but also fosters a sense of responsibility towards marine ecosystem preservation. Importantly, as the entire system can determine the concentration of microplastics in the sea, it serves as an eye-opener, providing



valuable insights for environmental awareness and facilitating targeted cleanup efforts.

From an environmental perspective, the innovation in applying state-of-the-art obstacle detection technologies directly contributes to environmental conservation. By ensuring the vessel's capability to navigate safely and avoid collisions, the technology minimizes the risk of environmental damage, reinforcing the project's commitment to preserving marine ecosystems. Moreover, the entire system's ability to determine the concentration of microplastics in the sea holds paramount importance, providing a practical tool for initiating cleanup initiatives. Examining personal development, individuals engaged in the research gain unique experience in developing and implementing cutting-edge technologies. This not only enhances their individual skill sets but also positions them as valuable contributors to advancements in autonomous marine systems, fostering both personal and professional growth.

The overarching impact of integrating cutting-edge obstacle detection technologies into the development of a new vessel within the SMARTPOL project underscores its significance in influencing scientific, economic, societal, and environmental dimensions. This dual focus on pollution detection and the innovative application of technology positions SMARTPOL as a pioneering initiative with the potential to shape the future of marine technology and environmental conservation.

KEYWORDS

obstacle, avoidance, detection, smartpol



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The Malta Council for
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ANTIVIRAL MEDHERBS: Investigating the antiviral activity and immunomodulatory effects of Mediterranean herbs and spices against SARS-CoV-2

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BACKGROUND

In 2020 the COVID-19 outbreak, which was caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus, spread all over the world and was responsible for the deaths of millions of people. Since then, effective vaccines have been developed. However their method of administration remains invasive. Alternative and simpler solutions are still required in order to combat the spread of the virus.

Though new synthetic drugs are in development specifically targeting COVID-19, so far the search for small-molecule inhibitors has mostly focused on repurposing existing drugs. The use of synthetic medicines involves a number of important advantages and disadvantages, the latter of which can be circumvented by opting to use naturally-derived antivirals, when these are available. Plants, particularly herbs, contain a vast array of chemicals which evolved to defend the plants from pests and pathogens, including viruses. In fact, plants have historically served as the original source of a very large number of important drugs, most of which are still in use today. Besides, naturally-derived compounds are worthy therapeutic alternatives since they are innately better tolerated in the human body.

Herbal exploration specifically targeted against SARS-CoV-2 has already been performed. Spices and herbs have been extensively studied globally due to their high antioxidant and antimicrobial activity, and their beneficial effects on humans. For self-care during the COVID-19 pandemic, the use of spices such as turmeric, cumin, coriander, garlic and the drinking herbal tea made from basil, cinnamon, black pepper, ginger, and raisin have been recommended once or twice in a day (Singh et al., 2021). Now, we propose to confirm whether these commonly used herbs and spices specifically inhibit SARS-CoV-2 or act only as immunity boosters, and to investigate some comparatively understudied Mediterranean herbs.

OVERALL AIM

The aim of this project is to investigate the antiviral activity, immuno-modulatory, and antioxidant effects of selected Mediterranean herbs and spices against SARS-CoV-2. A combination of silico methods, high-throughput techniques, and in vitro



models are being used. The overall objective is to evaluate the antiviral potential of some of the natural products found in Mediterranean herbs to aid in overcoming COVID-19.

MAIN EXPECTED OUTCOME/S

The discovery of potent SARS-CoV-2 inhibitors within the pool of natural compounds available is not guaranteed. Even so, this study will certainly produce meaningful insights into the antiviral, antioxidant and immune-modulatory effects of Mediterranean herbs and spices. In turn, this will help provide safer and simpler alternatives for the continued management of COVID-19, and promote the Mediterranean diet as a valuable and culturally acceptable dietary pattern.

RESULTS

The project is half-way through its second year, and a number of main targets have already been reached. During the first year, a list of known natural compounds found in selected Mediterranean herbs and spices has been compiled. This has been further extended to a full Literature Review, which is being published separately. Secondly, a number of in silico models have been created, targeting specific mechanisms required by SARS-CoV-2 in order to complete its life-cycle. The models have been used to predict which of the compounds from the list of natural products are most likely to exhibit SARS-CoV-2 inhibitory activity. Thirdly, samples of different plants have been collected from around Malta. Hydroalcoholic extracts of these plants have been prepared. Fourthly, the total phenolic content, total flavonoid content, total flavanol content and total ortho-diphenolic content of the extracts have been determined using separate assays. Additional results which have been collected this year include the testing of potential cytotoxic effects of the plant extracts on different human cell-lines and actual measurement of the antioxidant activity of the plant extracts using different assays. Meanwhile, pseudovirus production and transduction has been performed in order to produce the tools required to determine the specific SARS-CoV-2 activity of the plant extracts.

IMPACT OF RESEARCH

The scientific impacts of this research include furthering our knowledge of the role which small molecules and natural products can have in the fight against COVID-19 and other viral diseases. Novel compounds and previously unknown bioactivities might be discovered. The understanding of the mechanisms through which natural compounds hinder the activity of viruses will also be better understood.

The social importance of this research include the promotion of the Mediterranean diet as healthy and beneficial. It will also increase our appreciation of Mediterranean plants, particularly herbs and spices, and the positive effects which they can bring.

From an economic perspective, this research will allow the interaction with the business community and stakeholders, and will serve to stimulate new partnerships among Mediterranean researchers and innovators. The outcomes of this project will lead to the improvement of Agro-food activities, and healthy food production as well as more sustainable food sources.

From an educational perspective, the research allows for the collaboration between Maltese and Turkish researchers. This sharing of knowledge will expand the expertise of MCAST staff, and allow the on-boarding of new, valid researchers. It will also bring current and future students closer to the state-of-the-art in research into natural compounds.

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KEYWORDS

COVID-19, Mediterranean plants, antiviral, antioxidant, plant extracts



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Enhancing Education Curricula on Electromobility (TRAILS)

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BACKGROUND

This research is conducted under the Youth for Sustainable Mobility and Inclusion (TRAILS) project funded by the EIT Urban Mobility. EIT Urban Mobility is an initiative of the European Institute of Innovation and Technology (EIT). Since January 2019, with its funded projects, EIT has been working to encourage positive changes in the way people move around cities in order to make them more liveable places. By fostering innovation and transformation, EIT Urban Mobility strives to improve people's quality of life, decarbonize mobility and make Europe's economy more competitive.

Under this umbrella, the TRAILS project fosters innovation in electromobility education in Bulgaria and Malta through capacity-building actions, igniting and expanding their education and future work capacity.

In Malta, TRAILS is implemented by the Applied Research and Innovation Centre and the Institute of Engineering and Transport within MCAST. In Bulgaria, the project is led by Cleantech

Bulgaria, a business network specializing in clean technologies, innovation, and sustainable development.

The primary focus revolves around crafting educational content on electromobility and piloting and reviewing this material with relevant stakeholder groups. Consequently, project initiatives are directed toward engaging youth, students, academic faculties, and professionals within the electromobility sector. TRAILS' principal deliverable is a versatile training model readily to be embraced by educational institutions in Malta and Bulgaria for effective and practical training for the electromobility education.



OVERALL AIM

The research aims to provide a unified framework for educational institutions, covering programmes related to the mobility sector: engineering, mechanics, machine automation, vehicle design and development etc., with which to support lecturers in delivering contemporary, relevant and practical courses to their students. The model is designed for students at higher education institutions, professional schools, vocational training centers, and industry representatives and aims to support all stakeholders' needs for additional skills and knowledge in electromobility.

MAIN EXPECTED OUTCOME/S

The expected outcomes of the research project foresee:

- *Developing new knowledge and skills, helping young people adapt to the needs of the time and industry.*
- *Solving challenges in the electric vehicle industry caused by the lack of sufficient qualifications of the incoming workforce.*
- *Building a network among students and auto industry representatives to successfully develop entrepreneurial skills and capacity.*
- *Securing direct interaction between youth, entrepreneurs, and industry to foster collaboration among stakeholders.*
- *Drawing out benefits for the social and economic growth of the countries and regions where the training model is applied.*

RESULTS

The methodology behind the model relies on the evaluation of a needs assessment conducted in both Malta and Bulgaria, measuring the impact of technological trends, the internal and external changes affecting the sector, rating the importance of skills for different occupations related to mobility, the time respondents are willing to commit to additional training. Additional desk research and literature review fed into the data collected by the needs assessment. The analysis of the accumulated data resulted into the development of a Training Model that would cover gaps in skills related to the maintenance and repair of motor vehicles since this is the most distinguished occupation among the participants in the needs assessment. Still, the model's content is designed based on its applicability among the practitioners in product/maintenance/process engineering, seller and marketing specialist, car mechanic, disassembling and recycling technician and electrical/electronic engineer. The model contains three (3) modules respectively: Module 1 on Technical skills, Module 2 on Entrepreneurship with its submodule on EIT UM Programmes and Courses and Module 3 on Legislation and Regulatory Compliance in Electromobility. Each

module is designed to address specific aspects of the electromobility industry and provide learners and readers with a well-rounded understanding of the subject matter.

IMPACT OF RESEARCH

The research has the potential to impact the scientific field by advancing technology, influencing policy, fostering collaboration, and contributing to a more sustainable and environmentally friendly future. It is a field with significant real-world implications and opportunities for positive change.

It provides insights into the economic impact of this industry in Malta and Bulgaria, which can be valuable for government agencies, businesses, and investors. Therefore, it can influence the development of regulations, incentives, and standards that support the growth of electric transportation and a more sustainable energy infrastructure. Following an interdisciplinary approach, the research can further contribute to fostering interdisciplinary collaborations and knowledge sharing.

At the national level, in both implementing countries, the research can also play a role in educating the public about the benefits of electromobility and sustainable transportation by being adopted by national education institutions. International cooperation and knowledge exchange in the pursuit of sustainable transportation solutions is also hoped to have an impact. More specifically, the research has the potential to heighten awareness and inspire greater individual adoption of electric vehicles while garnering support for associated technologies and policies.

KEYWORDS

Education, Electric Vehicles, Entrepreneurship, Sustainable Electromobility, Training Model.



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An overview on Smart Ballistic Optimization for Repairing of Aerospace Exostructures using 3D printed Kevlar

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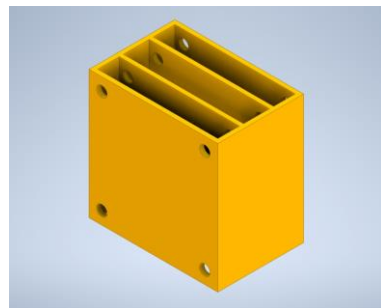
² University of Padova

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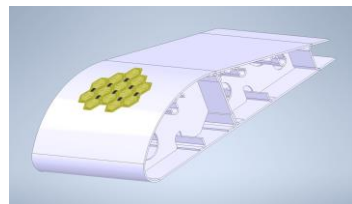
BACKGROUND

Impact resistance, mass and quality-controlled manufacturing methods are key considerations for the selection of materials used in aerospace. Continuous Aramid Fibers (like Kevlar®) are widely used for reinforcement of military and civilian armour systems due to their excellent impact resistance and high strength-to-weight ratio properties.



OVERALL AIM

In recent years advancements in the aerospace sector revealed the need for improved repair strategies, following a high-energy impact, such as a bullet or a space debris collision. Additive manufacturing represents a promising field of research allowing for great flexibility in the design of multilayer protection shields and aerospace structures.

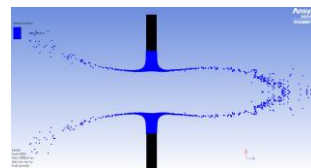


MAIN EXPECTED OUTCOME/S

Here is presented the roadmap to develop ballistic optimized 3D printed continuous fiber-based shields for aerospace high-energy impact applications. One of the core novelties is the multi-objective optimization procedure applied in the design of the experimental samples, which are evaluated through simulations and laboratory tests.

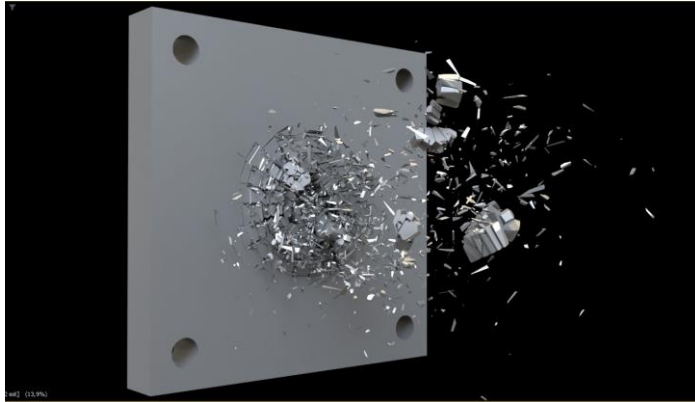
RESULTS

The advantage of this process will be its implementation time frame when compared with traditional methods and the high level of customization possible for specific cases.



IMPACT OF RESEARCH

The described project will represent a paradigm shift for repairing procedures applied to manned modules in space and for new and more efficient small satellite shields.



KEYWORDS

space debris, hypervelocity impacts, 3D printed shields

Data Analysis in the wine industry.



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FUSION
The R+I
Programme



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Mediterranean Island Cleantech Innovation Ecosystem (MICIE) project

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BACKGROUND

The consortium partners represent the quadruple helix (CUT/MCAST: Academia, OEB/MCCEA/CKIC: Industry, EWA/DMRIDP: Public bodies and CEA: civil society and citizens), will involve all relevant stakeholders in Cyprus and Malta and will work towards the creation of innovation ecosystems that will enable a climate-neutral Europe by 2050. The partners from Cyprus and Malta have already been working on the said topic over the past 5 years and have been advising their respective Competent. In the case of Cyprus, CUT prepared the first such study in Cyprus entitled "Cyprus Regional Cleantech Innovation and Entrepreneurship Hub Study", while CUT/CEA prepared a "Report on the NECP and Recommendation on the Research and Innovation Section" on behalf of the Ministry of Agriculture, Rural Development and Environment. In the case of Malta, EWA drafted the National Strategy for Research and Innovation in the fields of Energy and Water. The development of the Strategy is closely linked to the European drive to expand and further R&I activities, as this is increasingly viewed as a cross-cutting measure necessary to enable Member States realize their national ambitions and the EU, as a whole, to deliver on its overarching objectives. In line with this perspective, the Strategy seeks to further support research and innovation work in energy and water, two areas deemed to be of national importance.

OVERALL AIM

Thus, the overall aim of the MICIE project is for Cyprus and Malta, being small islands with similar needs, barriers and peculiarities, and are being considered 'moderate' and 'modest' innovators, to capitalize (a) on their work up to date and (b) on the experience and the support of EIT Climate-KIC from across Europe ('innovation leaders' and 'strong innovators') to build interconnected and inclusive innovation ecosystems, that will assist them in tackling the innovation gap and in achieving the energy and climate targets set out in the NECP. Overall, it is expected that the Global Cleantech Innovation Index (GCI), Global Competitive Index (GCI) and the European Regional Competitiveness Index of Cyprus and Malta will grow through the proposed cooperation, and will thus improve their standings in the Global Entrepreneurship Monitor (GEM).

MAIN EXPECTED OUTCOME/S

Through the Mediterranean Island Cleantech Innovation Ecosystem (MICIE) project, the partners will:

- Identify and analyse existing similar innovation ecosystems worldwide (i.e., the case of Hawaii and Okinawa), drawing from lessons learned in those cases,
- Connect, through EIT Climate-KIC, with other mature ecosystems across Europe for joint actions,
- Apply the Systems Innovation Approach for a holistic approach towards the co-creation, co-planning and co-investments for the creation of innovation cleantech ecosystems,
- Identify, analyse, classify and cluster all relevant local and national actors and engage them through a series of workshops,
- Write up an action plan for the setting up of joint programmes, that can be used specifically in the case of Cyprus and Malta to stimulate innovation procurement to help the market uptake of innovative solutions. The action plan can also as a template with guiding principles for other areas (i.e. Greek and Spanish Islands, Madagascar, etc.),
- Plan and ensure the long-term sustainability of the joint programmes and action plan through collaborations with other funding mechanisms, and
- Communicate the results of the project, both nationally and at an EU level.

RESULTS

Based on the above, the following Outcomes/KPIs will be:

- Analysis of 4 similar cleantech innovation ecosystems and 10 mature innovation ecosystems worldwide,
- Connection with 4 other ecosystems for joint programmes,
- Involvement and interaction with at least 200 actors from the quadruple helix,
- Identification of at least 10 joint programmes, including their funding sources
- Establishment of 2 action plans, that will assist the Competent Authorities of Cyprus and Malta in achieving the energy and climate targets set out in the NECP
- Dissemination of the project's outcomes to more than 200,000 individuals

Overall, the aim of the Mediterranean Island Cleantech Innovation Ecosystem (MICIE) project is aligned both with the objectives of the call and the needs of the local ecosystems, and the project partners are more able and have the resources to bring this project to a fruitful completion.

IMPACT OF RESEARCH

1. *Raise awareness, knowledge and practical use of legal procedures to implement the practices of innovation procurement. Through the System Innovation Approach, utilizing the EIT Climate-KIC "Visual toolbox for system innovation", and the stakeholder engagement through a series of workshop, all actors of the quadruple helix will be involved in drafting the proposed action plan, which will document the necessary steps for innovation procurement. Furthermore, through our dissemination activities (social media, public events), we aim to also inform the wider public on this topic.*
2. *Leverage capacity building, skills and legal knowledge among public and private buyers. In order to contribute to this outcome, all sectors of academia, industry and the public sector will be involved with a 1 new Incubator/Accelerator being formed to leverage on the project's main results/ It is expected that at least 5 research organisations will support the cleantech innovation ecosystem, 5 banks will uptake and/or fund the joint programmes and 2 investor groups will support the cleantech innovation system.*
3. *Explore and scale up the best examples of innovation procurement practices, Through Phase 1 (Benchmarking Pathways) of the project, we will focus on identifying the current state-of-the-art and will focus on best practices benchmarking, which includes but isn't limited to facilitate regional comparisons based on the Global Cleantech Innovation Index (GCII) and generalize the benchmarking approach from European level to worldwide. The Report to be Associated with document Ref. Ares(2022)4299799 - 10/06/2022 7 [101070800] [MICIE] – Part B produced will provide wise advice, best practice (and next-practice) to policy makers and practitioners in cleantech ecosystem.*
4. *Contribute to the establishment of innovation friendly legal frameworks, and market-oriented procedures, The final Action Plan will include all aspects of the establishment of a cleantech innovation ecosystem, and a friendly legal framework, and market-oriented procedures are an integral part of such an action plan.*
5. *Ensure long-term and sustainable innovation procurement strategies, Actors from the quadruple helix from both countries are participating in this project (specifically Business Associations and Competent Authorities)*



and thus they will ensure that the action plan, drafted by them, will be both sustainable and enforceable.

- 6. Foster public and private partners' collaboration in the co-design processes to match their needs and identify existing technologies that could result in procurement of innovation. Through the System Innovation Approach, and the workshops to be conducted in both countries, both public and private partners will be involved in the co-design of the necessary actions/ programmes.*

KEYWORDS

Innovation systems



MICIE

Mediterranean Island Cleantech
Innovation Ecosystem



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Transforming advanced water skilling through the creation of a network of XR water emulative centres

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BACKGROUND

WATERLINE is a project addressing challenges faced by Higher Education Institutions (HEIs), including limited capacity, mobility, and social issues like gender inequalities. The COVID-19 pandemic emphasized these limitations while presenting opportunities for digital advancement in higher education. HEIs are moving towards collaborative and co-creative approaches within innovation ecosystems, departing from traditional linear innovation methods.



WATERLINE's core mission is to establish a European HEI digital water campus featuring four Extended Reality Water Emulative Centres in select HEIs across Europe. These HEIs possess specialized expertise in water-related themes and will collaborate using shared frameworks. WATERLINE aims to co-create fundamental components of a common Master's program, tailored teaching materials, and skill development resources for these emulative centers. Additionally, the project seeks to enhance the capacity of academic and research staff to support this new skilling paradigm while reinforcing HEIs' roles in local ecosystem development.

WATERLINE aligns with global sustainability visions, including the United Nations Sustainable Development Goals (SDG) 4 and 6, focusing on sustainable education and water-related issues. Furthermore, it is fully integrated into Horizon Europe's Mission Restore our Ocean and Waters, highlighting its commitment to addressing critical environmental concerns.

The project also aims to support the consolidation of the Digital Water HEI Alliance, aligning with the European Education Area's vision of enhancing the quality of education and training through cross-border mobility and cooperation. This dovetails with the European Commission's objective of further developing the European Universities Initiative, fostering collaboration across languages, borders, and disciplines to address societal challenges and skills shortages in Europe.



While existing European Universities Initiatives concentrate on joint engineering programs and curricula using digital formats, WATERLINE stands out as a unique initiative solely dedicated to Digital Water. Leveraging a cooperative approach, it aims to foster excellence, innovation, and inclusion across European HEIs and contribute to the European Research Area's mission of upgrading knowledge infrastructures, building capacity, and inducing structural transformations. The WATERLINE consortium comprises 10 main beneficiaries and five associated partners, representing a diverse group of European organizations committed to advancing digital water education and research.

OVERALL AIM

The WATERLINE project aims to establish a European Digital Water Higher Education Institution (HEI) Alliance, guided by the quadruple helix model of innovation, to advance research, education, and entrepreneurship in the water domain.

MAIN EXPECTED OUTCOME/S

The WATERLINE initiative aims to create a sustainable ecosystem for learning and innovation by leveraging individual, institutional, and regional resources. It focuses on five key objectives: consolidating the Alliance through governance and capacity-building, enhancing Master's level water-related programs with virtual reality labs, building research capacity through skill-building activities, establishing a knowledge network for water-related education, and ensuring sustainability and outreach through ambassador networks and collaboration with EU initiatives. These efforts are designed to promote excellence in research, education, and entrepreneurship in the European water domain.

RESULTS

Over the past year, significant progress has been made in the project, including the identification of learning environments and an analysis of partnership barriers and opportunities. Furthermore, an ecosystems mapping exercise was conducted to understand the innovation landscape, and work began on transforming the three-tier learning environment. In particular, a consolidated architecture for the implementation of the development of student centered Virtual Reality scenarios have been established. These achievements signify WATERLINE's commitment to advancing European water education and innovation through collaboration, innovation, and sustainability.

IMPACT OF RESEARCH

The WATERLINE project aims to have a significant and lasting impact across five key Expected Impact Categories (EICs):

EIC1: Structural Changes for Competitive R&I HEIs: WATERLINE seeks to transcend existing limitations in research and education within Higher Education Institutions (HEIs) by creating a digital water HEI alliance. This collaborative effort will merge various disciplines such as engineering, information technology, science, and social sciences, motivating early researchers to engage in diverse research initiatives. It involves creating a common Master's program with flexible learning options, ultimately transforming and making HEIs more competitive.

EIC2: Strengthened R&I Capacity for HEI Academics/Researchers: Collaboration within the inter-university digital water campus framework will focus on human capacity building and knowledge sharing. This will involve a top-down approach, creating a capacity building plan for cross-institute research, and a bottom-up approach, building from nominated consortium members' interactions. Activities like skill enhancement for participating academics and researchers will further boost capacity.

EIC3: Involvement of Regional Actors in R&I: Recognizing the significant role played by regional industry and societal actors in the water sector, WATERLINE will map their skills and engage them using Responsible Research and Innovation (RRI) principles. It aims to create a multi-stakeholder platform to address skills gaps and mismatches related to "Digital Water." This approach will involve consultation, drive the design of governance frameworks, and ensure a holistic perspective on education, R&I, and skills.

EIC4: Strengthening Academic-Private Sector Linkages: The project emphasizes the importance of providing industry with knowledgeable workers and solutions for efficient water utilization. WATERLINE aims to equip academics and graduates with the skills and mindset to act as social entrepreneurs and innovators. Cross-pollination of knowledge between academia and the private sector will facilitate competency sharing for the water sector.

EIC5: Increased Participation in R&I Funding Schemes: In a bid to enhance national and European investments in water-related research, WATERLINE takes a specialized and dedicated approach to capacity building in digital water. By focusing on competency development and specialized expertise, especially in Widening countries, the project aims to increase participation in Horizon Europe and national schemes. Activities include research implementation, digital water skilling, publication writing, proposal development, and creating a clustering plan to synergize with EU initiatives and projects.

Overall, WATERLINE aspires to drive structural changes in HEIs, strengthen R&I capacity, engage regional stakeholders, foster academic-private sector collaborations, and enhance participation in research funding schemes. These



efforts collectively aim to transform the landscape of water-related education, research, and innovation in Europe, addressing critical societal challenges in the process.

KEYWORDS

Water resources, Integrated water management of water, water quality monitoring, water-climate interactions, Innovation.



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Sensor Fusion for Underwater Robot Localisation

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BACKGROUND

Underwater localization schemes can be broadly classified into three strata — Dead Reckoning (DR), Geophysical and Artificial Reference. Although each of these schemes may be adopted independently to achieve reasonable performance, a common approach is to develop a hybrid localization system comprising more than one of these schemes. By leveraging the strengths of multiple schemes, such collaborative schemes have been more successful.



OVERALL AIM

Due to the constraints posed by the sensors employed on the AMBULANT AUV, in this research, the focus is on a hybrid localization system comprising of a DR solution that makes use of an inertial navigation system (INS) and an Artificial Reference solution that makes use of an onboard GPS. Such DR systems are more commonly referred to as GPS/INS solutions. The aim is to cater for GPS denial when the robot is underwater by estimating the position using the INS sensors.

MAIN EXPECTED OUTCOME/S

The expected outcome is a solution that provides a 'tunable' algorithm that can be adjusted depending on the GPS outage duration. The algorithm will be tested such that the deviation from the ground truth is known for different GPS outage durations.

RESULTS

Currently, two algorithms are to be investigated, the asynchronous Kalman Filter and the Alpha-Beta-Gamma filter. These are currently being tested under a simulated environment in MATLAB such that the accuracy vs. complexity tradeoffs are determined.

IMPACT OF RESEARCH

This project could advance the state-of-the-art in underwater robotics, navigation, and localization. It could also enable new applications and discoveries in marine



science, such as exploring the deep sea, mapping the ocean floor, monitoring the marine ecosystem, and studying the effects of climate change on the oceans.

This project could create new opportunities and markets for underwater robotics, such as tourism, entertainment, education, security, and defense. It could also reduce the costs and risks of underwater operations, such as oil and gas exploration, mining, salvage, and maintenance.

This project could benefit society by improving the safety and efficiency of underwater activities, such as search and rescue, disaster relief, environmental protection, and law enforcement. It could also increase public awareness and appreciation of the marine environment and its diversity.

This project could contribute to the conservation and restoration of the marine environment by providing more accurate and reliable data on ocean conditions, such as temperature, salinity, currents, waves, and pollution. It could also help to detect and prevent threats to marine life, such as overfishing, invasive species, habitat destruction, and acidification.

It could improve the competitiveness and productivity of the industry by providing more advanced and robust solutions for underwater robotics, navigation, and localization. It could also foster collaboration and partnership among different sectors and stakeholders, such as academia, government, private companies, and non-governmental organizations.

This project could enrich the curriculum by introducing new topics and concepts related to underwater robotics, navigation, and localization. It could also provide practical examples and case studies that demonstrate the relevance and applicability of these topics and concepts to real-world problems.

This project could align with national and global priorities by addressing some of the key challenges and opportunities facing the world today, such as energy security, climate change mitigation and adaptation, biodiversity conservation, sustainable development, and human well-being.

KEYWORDS

Unmanned underwater vehicle, Sensor Fusion, GPS denial



SINO MALTA
BILATERAL FUND



The Malta Council for
Science & Technology

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AutonoMous Bio-mimetic Underwater vehicle for digitAI cage moNiToring

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BACKGROUND

Traditional cage aquaculture requires marine biologists to periodically assess the water quality and estimate fish biomass to ensure optimal conditions for the specific



marine ecosystem being cultured. This periodical assessment poses considerable risks due to accessibility and safety, while also incurring high costs to perform in-situ measurements and fish biomass estimations.

This two-year project, funded by the Science and Technology Cooperation Sino-Malta Fund, aims to propose an alternative unmanned solution via the development of a hybrid drive biomimetic underwater robotic cage-monitoring system. This robotic system will incorporate state-of-the-art digital technologies to provide reliable underwater 3D positioning and localisation, Spatio-temporal warnings for water quality, fish biomass estimations and benthic identification systems. Additionally, computer vision modelling will be used to support the digitalisation of environmental monitoring in Malta, specifically survey and mapping of benthic habitats. This technology has the potential of reducing the cost of breeding, improve the efficiency of breeding, and realise a safe and sustainable approach for the comprehensive monitoring of deep-sea cages and marine environment.

OVERALL AIM

This project Intends to build a lightweight, low-power, monitoring module based on an underwater biomimetic robot platform to perform water quality spatiotemporal warnings, fish biomass estimation, benthic identification and provide a solution for realizing high-efficiency and high-quality comprehensive monitoring of deep-water cages.

MAIN EXPECTED OUTCOME/S

Expected Outcomes:- Design and construct innovative integrated rigid-flexible coupling hybrid-drive bionic underwater robotic system prototypes with the capability of autonomous 3D positioning and localisation within deepwater

environments, and reduced noise and disturbance during unmanned underwater monitoring.

- Design and construct a spatial prediction model for water quality in marine environments and aquaculture.

- Develop and construct a Biomass Estimation Model for fish biomass estimates based on multi-module convolutional networks.

- Develop and construct an automated benthic detection and identification system of key marine features (endangered species, invasive species, benthos type, lost or damaged maritime infrastructure} through machine learning, machine vision prototypes and artificial neural networks.

- Demonstrate the integrated platform for digital deep water net cage comprehensive monitoring system in China. This demonstration will showcase the application of the water quality prediction model and the biomass estimation model.

- Demonstrate in Malta the benthic habitat model for live identification of Maltese marine benthic habitats from ROV captured video in the depth range 10-10 meters.

RESULTS

Preliminary Results:

Collected and processed around 7,000 images so far.

IMPACT OF RESEARCH

The outcomes of this project will likely contribute to promote an environmentally healthier development of the aquaculture industry, resulting in economic, social environmental and political/diplomatic benefits.

1) Political and diplomatic benefits

This project involves the cooperation with international partners that has to potential to promote the cooperation in the market promotion of high-tech solution in the field of deep-cages aquaculture, contributing to the introduction of innovative solutions based on digital transformation. This will in turn promote th continuous expansion of new areas of international cooperation between Malta and China.

2) Economic benefits

The main aim of this project is to carry out the design of an underwater bionic robot system which integrates:

- A water quality spatio-temporal warning system*
- A biomass estimation system*
- An automated benthic population recognition system*

The development and implementation of such a system has the potential to upgrade the traditional aquaculture model towards a more efficient ecologically-

sustainable aquaculture system, based on digital transformation. This will allow to develop an aquaculture production process based on more scientific, digital, and precise data, thus reducing the economic loss often caused by a blind aquaculture production, while improving the environmental impact.

3) Ecological Benefits

The implementation of this project has the potential to provide scientific data to monitor real-time changes of environmental factors in the aquaculture process. The research will combine physical models and simulations to reduce the harm caused by water quality mutations to fish growth, while providing real-time fish growth data that will improve the production processes. This will allow for a more accurate and scientific decision-making process for the use of bait, fertilization and drugs in the aquaculture process, that is likely to result in a significant reduction of wastes. Thus, such technology and approach will contribute towards reducing the impact that the aquaculture industry usually has on the environment and surrounding ecosystems, while promoting the transition towards more sustainable models.

KEYWORDS

AMBULANT, AI, Benthic, Computer Vision, Marine

Project AMBULANT received funding from the Malta Council for Science and Technology (MCST) and the Ministry for Science and Technology of the People's Republic of China (MOST), through the Sino-Malta Fund 2021 (Science and Technology Cooperation) under grant agreement number SINO-MALTA-2021-18



The Malta Council for
Science & Technology



EIT Urban Mobility Regional Innovation Scheme Hub Malta

Pelin Uner

MCAST Applied Research & Innovation Centre

BACKGROUND

EIT stands for the European Institute of Innovation and Technology, an independent EU body that aims to promote sustainable economic growth and innovation across Europe. EIT operates through a network of Knowledge and Innovation Communities (KICs) focused on various societal challenges. KICs are the independent but operational parts of the European Institute of Innovation and Technology (EIT), which puts the innovation web into practice.

EIT Urban Mobility is one such KIC, specializing in transforming urban mobility systems to make them more sustainable, efficient, and people-centered. It brings together leading organizations from academia, industry, and the public sector to foster collaboration and drive innovation in urban mobility.

Within the EIT Urban Mobility network, the RIS Hub Malta plays a vital role. The RIS Hub Malta serves as a regional innovation hub based in Malta, focusing on addressing urban mobility challenges specific to the local context. It collaborates with various stakeholders, including universities, businesses, and government bodies, to facilitate the development and implementation of innovative solutions for urban mobility in Malta. The hub acts as a catalyst for knowledge exchange, entrepreneurship, and research, with the ultimate goal of enhancing the mobility experience, reducing congestion, and improving sustainability in Maltese cities and urban areas.

OVERALL AIM

EIT UM RIS Hub Malta aims to be a driving force for positive change in Malta's urban landscape. Focused on fostering innovation, collaboration, and sustainable practices, the hub endeavors to address specific urban mobility challenges unique to Malta. By bringing together diverse stakeholders, including academia, industry, and governmental bodies, the hub seeks to catalyze the development and implementation of cutting-edge solutions. Through its initiatives, the RIS Hub Malta aspires to enhance the overall quality of urban life by promoting efficient, environmentally friendly, and inclusive urban mobility strategies that align with the specific needs and characteristics of Malta's urban environments.

MAIN EXPECTED OUTCOME/S

Outcomes and impacts must be in line with the Strategic Objectives of the EIT UM Strategic Agenda. The wider impact is to gradually decrease the knowledge gap between cities, academia, research, and industry. Cities will be encouraged to

assess and present their main challenges and seek out, test, and co-create solutions. There will be opportunities to commercialize innovative solutions, while the businesses can deploy their product and service prototypes in urban mobility test beds facilitated by the EIT UM RIS Hub Malta consortium partners.

RESULTS

As of the present, the EIT Urban Mobility RIS Hub Malta has made significant strides toward its objectives. Through strategic collaborations and initiatives, preliminary results indicate a heightened awareness and engagement among stakeholders regarding urban mobility challenges in Malta. Initial research efforts have identified key pain points and opportunities, laying the groundwork for innovative solutions. Moreover, the hub has successfully facilitated knowledge exchange, fostering a collaborative environment for academia, industry, and government entities. The early stages of implementation showcase promising signs of improved urban mobility practices, with pilot projects demonstrating the feasibility and impact of sustainable solutions. These preliminary results underscore the hub's commitment to driving tangible change in Malta's urban mobility landscape and lay the foundation for future endeavors.

IMPACT OF RESEARCH

The research conducted by the EIT Urban Mobility RIS Hub Malta holds a multifaceted impact across various dimensions. Scientifically, our findings contribute valuable insights to the field of urban mobility, offering novel approaches and solutions to address the unique challenges faced by Malta's urban environment. Economically, the research outcomes have the potential to stimulate innovation and entrepreneurship, fostering a sustainable urban mobility industry that could contribute significantly to Malta's economic growth. On a societal level, the research aims to enhance the quality of life by promoting accessible, efficient, and eco-friendly urban mobility solutions, aligning with national priorities for improved living standards. Environmentally, the focus on sustainable mobility practices contributes to reduced emissions and environmental degradation. The research also has a personal development aspect, offering learning opportunities and skill development for individuals engaged in the field. Industry-wise, the implementation of innovative solutions can reshape urban mobility practices, creating new markets and opportunities. Academically, the research influences curricula by introducing cutting-edge topics relevant to contemporary urban challenges. Finally, aligning with both national and global priorities, the research addresses pressing issues related to sustainable development, making a tangible contribution to the global effort for more sustainable and resilient urban ecosystems.



KEYWORDS

Sustainable Urban Mobility, Livable Urban Spaces, Green Cities, Innovation, Collaboration, Stakeholder Engagement, Environmental Conservation, Quality of Life, Entrepreneurship, Skills Development



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DATAVISUAL

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BACKGROUND

Through the project DATAVISUAL we aim to contribute to addressing some emerging needs, namely: 1. NEW DIGITAL VET TRAINING FOR THE "NEW NORMAL". As we enter the COVID-19 recovery phase, it will be critical to rethink how Vocational and Educational Training should evolve after the cultural and societal changes brought about by COVID-19. More specifically, in the VET sector: a) we need to support teachers and trainers in providing digital solutions (e-learning), b) we need to produce online vocational SPECIFIC material, c) we need to overcome the extra-obstacles to internet access by some groups, d) we need to assess and certify new competencies digitally (Open Badges) 2. VET INNOVATION THROUGH E-LEARNING SOLUTIONS VET programmes suffered a double disadvantage because of the pandemic. The combination of social distancing requirements and the closure of enterprises has made practical and work-based learning - so crucial for the success of vocational education - difficult to implement. In this context, developing digital solutions (e-learning) that can close the gap between VET and the workplace is necessary more than before. Nevertheless, the digitalisation of VET training courses should not be considered just a solution to overcome the pandemic, but as an opportunity to introduce innovative learning methods in the VET training. 3. FUTURE SKILLS TO HELP EU ECONOMIC AND SOCIETAL RECOVERY One of the effects of digitalisation, through the development of freelance platforms and automated graphic design, has been the increase in the unemployment rate among graphic designers. People who for decades spent their daily time creating visual concepts for companies or communicating ideas that inspire, inform, and captivate consumers, suddenly found themselves out of a job. In this context, Bid Data Visualisation Skills can represent a great opportunity to upskill professionals at work and unemployed graphic designers offering, at the same time, an innovative training opportunity to young people. 4. TO DISSEMINATE EU BIG DATA STRATEGY. Data storytelling accomplishes a more general need from the EU Commission related to the dissemination of the EU Big Data Strategy and its distinctive element related to the fact that European values, fundamental rights, and human beings should represent the core of the Big Data strategy compared to the other global players.



OVERALL AIM

The aim of the Visual Report is to offer a Learning Material work based on the best practices of Big Data Storytelling. Indeed, besides the prevalence of text, another problem is that many visual displays are still poorly designed. The Visual Report will collect outstanding examples of Big Data Information Design in order to offer VET Trainees and Trainers a concrete example of a to-do practice. Each project partner will collect at least 4 best examples of Information Design for Big Data.

MAIN EXPECTED OUTCOME/S

The project addresses two general objectives and a set of correlated specific objectives: Project outcomes will be clearly related to the specific objectives of the project: General Objective: INNOVATE VET TRAINING THROUGH DIGITAL and INCREASE EMPLOYABILITY Specific objectives: 1.1 DEVELOP INNOVATIVE DIGITAL SKILLS. 1.2 DEVELOP INNOVATIVE E-LEARNING COURSES FOR VET PROVIDERS. 1.3 INNOVATE VET TRAINING THROUGH DIGITALISATION AND FUTURE SKILLS. 1.4 UPSKILL PROFESSIONALS AND UNEMPLOYED IN THE GRAPHIC DESIGN SECTOR. 1.5 INCREASE DIGITAL SKILLS CERTIFICATION AT THE EU LEVEL THROUGH INNOVATIVE METHODS (OPEN BADGE).

RESULTS

Project Result 1 - Visual Report on Big Data Information Design The Visual Report on Big Data Information Design is a written and visual account focused on Information Design's best examples for Big Data Storytelling and Visualisation. Nowadays, text still prevails despite the growing popularity of data visualization, it's clear that old habits die hard. The aim of the Visual Report is to offer a Learning Material work based on the best practices of Big Data Storytelling. Indeed, besides the prevalence of text, another problem is that many visual displays are still poorly designed. The Visual Report will collect outstanding examples of Big Data Information Design to offer VET Trainees and Trainers a concrete example of a to-do practice. Each project partner will collect at least 4 best examples of Information Design for Big Data. Project result 2 - Open Webinars on Big Data Storytelling THE OPEN WEBINARS ON BIG DATA STORYTELLING will be the second Open Educational Resource (OER) of the DataStorytelling project that consists of an e-learning course to share knowledge about how to Storytell Big Data. The online webinars will focus, at least, on 5 topics: 1) Data Set preparation, 2) Best practices of Information Design, 3) Best practices of Big Data Storytelling, 4) Tools and Digital Platforms for Big Data Visualisation (Tableau, Infogram, etc.), 5) The EU Strategy on Big Data. The open webinars will be developed by project partners and also involve external experts (e.g. Information Designers). At least 10 online webinars (1 hour per webinar) will be provided in a synchro (recorded) learning

mode. The activity will be coordinated by MCAST and Fondazione Clerici with the contribution of all project partners. O2 is a preliminary activity for the further implementation of the project and Big Data Storytelling competence open badge certification (O3). Project result 3 - Open Badge Certification System Open Badges are digital, verified by secure metadata, and a means for individuals to display, and organizations to easily verify certifications, achievements and awards online, including milestones on the way to full certification. Open Badges can be used in email signatures, personal websites, social media sites such as LinkedIn and Twitter, as well as on electronic copies of resumes. The O3 of the project DATAVISUAL will develop an OPEN BADGE CERTIFICATION SYSTEM of Big Data Storytelling competencies based on open badges. This open badge ecosystem brings flexibility, agility and timeliness within the competence certification, leading to an in-depth radical rethinking and putting into question all paradigms on which competence certification has been based for the last 20 years, e.g.: only an examiner with a superior level of education & competence compared to the candidate is habilitated to assess the demonstrated competence level.

IMPACT OF RESEARCH

1) The benefit will consist of developing a community of participants that is at the same time relevant to the project (focused on target groups) and large enough to test produced materials, and at the same time enriching participants not directly part of the project activities.

2) Benefits will also derive from the participation in the Multiplier Events: - increased knowledge and awareness of innovative curricula and teaching materials in the field of data visualization and storytelling.

KEYWORDS

Big Data, Visualisation, Power BI, Infographic, e-Learning



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SMARTPOL - Environmental Monitoring

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BACKGROUND

The marine and coastal ecosystem are especially threatened by sea-based contaminants attributed to various anthropogenic activities (both on land and in sea). The cumulative effects of marine pollution can be devastating for human well-being and ecosystem health. Ultimately, this can undermine sustainable economic growth. There are several agreements and legal mechanisms that have been developed in order to preserve all European coasts and marine waters, such as the MARPOL 73/78 Agreement, the 2002 EU Recommendation on Integrated Coastal Zone Management and the 2008 Marine Strategy Framework Directive. Nevertheless, the protection of coasts and marine waters faces complex and multifaceted challenges.

Marine pollution is one of the most significant environmental threats. Due to the dynamic, atmospheric, climatic and human effects, marine pollution may change rapidly. Monitoring the marine is crucial for understanding and preserving marine ecosystems, ensuring maritime safety, and promoting sustainable resource management. However, this is typically time consuming and laborious, and the results might take days until they are available for decision makers. Thus, SMARTPOL (Autonomous & dynamic marine pollution monitoring system for Inland Waters) provides an innovative and practical way in which monitoring and detection of pollutants is done in real time to adequately assess mitigation measure, as well as to identify the source.

OVERALL AIM

SMARTPOL aims to present a novel and practical pollution detection, monitoring and analysis system in real time.



The system will mainly consist of Shore Control Centre (SCC) and unmanned surface vessel (USV), both equipped with multi-sensor technology and AI based solutions. The USV will be equipped with pollution detection sensors for data collection. The data will be collected from the sensors and the results will be transmitted to the SCC. SMARTPOL will validate the data collected by the USV by monitoring pollutants on specific areas of Turkey, Malta and South Africa through sensors identified for pollutants monitoring.

MAIN EXPECTED OUTCOME/S

Given the significant anthropogenic influence, the focus in this project will predominantly be harbours. Whilst one can argue that monitoring harbours is not innovative per se, it is important to keep in mind that this is currently being done manually and at times results take days until they are collated and made available to the public. Real-time monitoring would ensure that the necessary actions are taken and mitigation measures are considered if need be. Nevertheless, the traditional approach of manual monitoring will still be done as ground truthing. Ground truthing will be important because it can help confirm or refute the accuracy of the data collected by the USV.

IMPACT OF RESEARCH

The system that will be applied in this project (SCC and USV) can be applied in several contexts, such as to monitor bathing waters, which are regularly monitored during the bathing season to safeguard public health and protect the aquatic environment in coastal and inland areas from pollution (Directive 2006/7/EC), safeguarding Marine Protected Areas, in which Malta, through the Natura 2000 network, has 18 sites, with an area of 4100km² and aims to conserve important habitats and species, in accordance with a number of directives (Ex. Directive 92/43/EEC, Directive 2009/147/EC, Directive 2008/56/EC). However, due to the diverse anthropogenic activities associated with harbours, efforts will focus predominantly on such sites.

Monitoring the sea is of utmost importance due to a wide variety of reasons. By monitoring the marine environment one can have a better understanding of the water quality, biodiversity, and the overall condition of marine habitats. This information is essential to identify and eventually address environmental issues such as sources of pollution and habitat degradation.

Safeguarding the marine environment is a global issue. Such issue is especially significant within the local context, as Malta heavily depends on the marine environment. Such a resource plays a fundamental role in Malta's economy through industries such as fishing, aquaculture, and tourism. Furthermore, Malta's geographical location as an island means that the marine environment is an



essential mode of transportation for both goods and people. The ports and harbours facilitate trade and connect Malta to the global market. Thus, SMARTPOL aims at detecting and responding to potential threats such as oil spills and maritime security risks in real time. This will allow for a quick response to reduce potential environmental harm.

This project will provide a better understanding to preserve marine ecosystems, ensuring maritime safety, and promoting sustainable resource management.

KEYWORDS

Marine Pollution, Detection System, Unmanned Surface Vehicle, Multi-Sensor Technology, Autonomous Network System



Project SMARTPOL is funded by the MarTERA partners - Malta Council for Science and Technology, and supported by the European Commission under grant agreement MRT-2021-057A.



The Malta Council for
Science & Technology

A study into the design of a remotely-controlled and autonomous sea-faring drone for monitoring water quality in the sea.

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⁶ Beneficiaries: MCAST, AquaBioTech Group, Yildiz Technical University, Cape Town University, Interactive Software, Sirena Marine.

BACKGROUND

Local marine zones are important for various industries and activities including fishing, fish-farming, recreation, seawater extraction for reverse osmosis, shipping, amongst other. Sea water is a dependable resource, however human activity over the years has placed the marine environment under significant threat. Over the years, these activities, caused a build-up of pollutants that are endangering marine lifeforms and affecting human health.

Plastics, in particular, are a significant cause for concern. Fish, turtles, mammals and seabirds often fall victim through the ingestion, suffocation and entanglement of larger plastic elements. Smaller elements such as microplastics find their way in the food web, and ultimately end up consumed by humans. Furthermore, plastics such as Polyvinyl Chloride (PVC) leach dangerous toxins, such as lead, dioxins, and vinyl chloride into the sea (Rios et al., 2007). These only add to pollutants commonly detected in the sea such as pesticides, herbicides, fertilizers, detergents, hydrocarbons, industrial chemicals and sewage, amongst other.



OVERALL AIM

The proposed research will involve the design, manufacture and remote-controlled testing of a one-third scale prototype that would, subsequently, pave the way for the manufacture of a full-size vessel. Electronic and sensing equipment for autonomous navigation and testing of water quality will be integrated within the full-scale prototype.

MAIN EXPECTED OUTCOME/S

The research will focus on hull design and testing for buoyancy, stability, locomotion and control. It will make use of 3D-printed and conventional materials,

construction and assembly methods, remote-control technologies and related equipment.

RESULTS

The one-third scale prototype performed satisfactorily during preliminary testing. Trials were carried out in the sheltered sea within Kalkara (Malta) creek. The catamaran appeared buoyant and stable when at rest. When underway, the prototype experienced a degree of hydrodynamic lift, mainly observed at the bow. With the motors running at the same speed, the vessel appeared steady, following a straight trajectory. Using only variable speed of the motors and propellers, the vessel turned successfully within a short turning circle. When traversing ripples, the oscillations were dampened within a very short time, resulting in the vessel stabilising itself quickly.



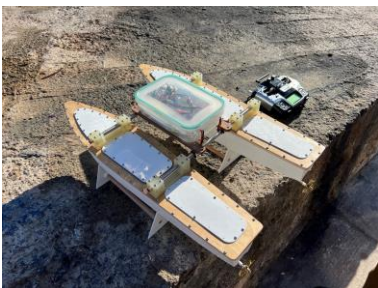
IMPACT OF RESEARCH

This research is expected to assist scientists by autonomously collecting data that could help better understand the extent of pollutants along the Maltese coastline. It will provide investment opportunities that could lead to economic growth, job creation, and societal benefits.

It can help address pressing societal challenges, such as maintaining water quality, safeguarding marine ecosystems, addressing climate change, etc. It will provide additional tools to tackle these complex issues.

It is expected to pose challenges in various fields of design and engineering, and generate new knowledge and discoveries.

This research will involve a number of technologies, methods, and approaches.



These innovations can have wide-ranging applications, possibly benefiting technological advancements in various industries.

Research findings could be incorporated into educational curricula, allowing students to learn about the latest discoveries. It will offer opportunities for students and aspiring designers, scientists and engineers to gain hands-on experience and training.

The data that will be obtained from this research can inform policy decisions in areas such as public health, and environmental protection, the use of USVs,



amongst other. Governments and organisations can use the scientific data obtained to make informed choices and develop evidence-based policies.

KEYWORDS

Catamaran, Prototype, Autonomy, Testing, Pollution, Water quality



Project SMARTPOL is funded by the MarTERA partners - Malta Council for Science and Technology, and supported by the European Commission under grant agreement MRT-2021-057A.



The Malta Council for
Science & Technology

STREAMing on-demand satellite data

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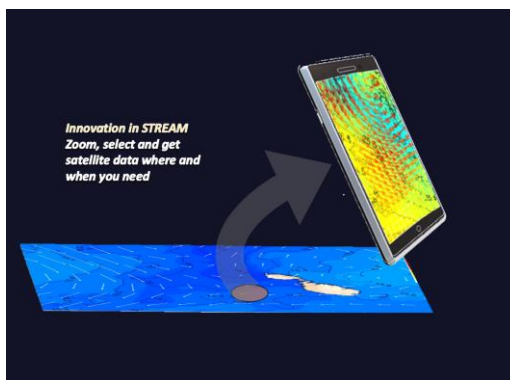
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⁷ GIS Laboratory, University of Gdansk

BACKGROUND

STREAM is an MCST Space Research Fund project intended to bring satellite earth observations closer to users by providing on-demand data with access through dedicated downstream services over smartphones and tablets. It takes advantage of the technology step shift in the value addition chain of data, transforming data into information, knowledge, and intelligence, providing sophisticated user experiences on the spot, with faster delivery and service elaborations on a wider range of affordable smart mass media. The work done in this project can be followed on www.stream-srf.com.



OVERALL AIM

Using state-of-the-art technology in API and UI development, the project is launching a prototype digital platform to elaborate and deliver satellite-derived data and information tailored-made to serve local stakeholders, operators, economic endeavours and general users to optimize, empower and enhance their activities, operations and products. STREAM delivers a specialised operational service seamlessly linked to satellite data sources, providing data to local users, and with the potential to replicate in other countries and regions. The project serves as a prototype leading to further exploitation for next generation services, and to strengthen the links between European data platforms and the national scale systems.?

MAIN EXPECTED OUTCOME/S

STREAM enhances the level of access and application of space data with local users, including the citizen level, to facilitate its integration into daily endeavours by operators and responsible entities, for decision-making, higher efficiency, and performance at reduced risks, delivering tailor-made and added-value services needed at different scales, disciplines, and levels of society. The project provides an intermediate platform dedicated to data fields covering the sea areas around the Maltese Islands, and more broadly the Malta shelf area up to the southern Sicilian coast, channelling data easily and customised to user needs from different satellite data sources.

RESULTS

The project execution is led by the scientific coordination and technical inputs from the oceanography section at the Institute of Engineering and Transport of the Malta College of Arts, Science and Technology. It is implemented jointly with two Maltese SMEs (MST AudioVisual Ltd and THINK Design Ltd) and engaged specialised staff, and the scientific excellence of DELTARES engaged on subcontracting basis, bringing together into the project the expertise for system design, setup, and operation, as well as for the user interfaces and a branded service delivery on electronic hand-held devices.

The STREAM focus is on the dedicated services that aim to enhance and expand the local capability in the use of full resolution operational satellite data. Merged to numerical modelling data, the service streams raw data upon user-defined requests, and additionally delivers specialised derived products in the form of indicators such as for heat wave alerting and water quality. The STREAM service is easy to use through a mobile-enabled interface that allows the user to make specific individual requests, selected and compiled on multi-functional input dashboards. Although intended as a proof of concept at this stage, the service targets different users, professional and non-professional, for research, education and awareness, monitoring and expert assessments, decision-making and planning, and to feed third party initiatives boosting private enterprise in many sectors. In particular, the prototype system delivered in this first project will favour fish farming, the monitoring of water quality in coastal sea areas, and of land-based sources of pollution in the sea. The area of interest is the Malta Shelf area covering the stretch of sea between Malta and Sicily, zooming on the sea around the Maltese Islands.

IMPACT OF RESEARCH

The main project challenge lies in the various technical aspects that need to be brought seamlessly to work together in a multi-functional process chain running

from data sourcing to operational scripts that automate data harvesting and automation of data processing and elaboration, to storage on a dedicated server that handles and organises spatial data, backend processes that channel data and respond to requests from a dedicated user interface that is intended to deliver peer services on a mobile application. These are the requisites of the STREAM digital platform that follows a modular design, using the latest available technologies, providing a versatile system architecture that is set for future evolutions. Hardware components consist of multiple redundant servers running VMware as the hypervisor, together with a centralised Network Attached Storage (NAS) interconnected over 10G connections to the core switch. A number of linux virtual machines are also used to house all the operational activity, together with providing SSL termination, firewalling and VPN connectivity. The GeoServer is the main software component through which end users will access data on the platform. Data is stored as a combination of GeoTiff and NetCDF files, alongside a PostgreSQL database with PostGIS extensions for data preparation to front-end via mapping and tiling Application Programming Interfaces (APIs) for delivery to users through OpenLayers and KML integration. Other software components comprise the JAVA Spring framework which is used as the main interface between internal components of the platform and the database. This same framework is also used to expose a restricted set of REST APIs to the front-end application for metadata sharing. Python is the main language used to programme the automation, scheduling, processing and value addition on data. The Featured Manipulation Engine (FME) is also used as the main Extract Transform Load (EFT) tool for modular data elaboration and integration, simplifying data workflows through in-built extract, transform and processing functions, with data being subsequently loaded into the central database and file repository. The FME's graphical user interface speeds up the overall design project and favours the performance of the system at execution.

Several innovations are implemented in STREAM: (i) while the focus is on EO data, other data fields such as from models are included to enable data inter-comparisons and forecasting, (ii) besides some web-based applications, the main service is made available on smartphones and tablets for easier accessibility to common users on the spot, (iii) visualisation will allow superposition of fields with user-friendly functionality, (iv) features include the viewing of time series at selected points, transects or areas of interest, together with the elaboration of simple statistics, (v) real-time data can be compared to climatological values, (vi) data selection and downloading will be available from the same service to provide one system for viewing, selecting and access to data. Moreover, the data fields will

be restricted on the limited area of interest of the service, namely the Malta shelf area and Maltese Islands, thus allowing higher resolution data fields to be available at fast performance.

KEYWORDS

Satellite observations, operational oceanography, downstream services, on-demand data, marine environmental monitoring



Project STREAM financed by the Malta Council for Science & Technology, for and on behalf of the Foundation for Science and Technology, through the Space Research Fund under grant agreement SRF-2022-4S1



MED-WET - Sustainable Water Irrigation and Supply for Agriculture

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BACKGROUND

The Mediterranean region faces significant water scarcity. High tourist activities during the summer months further stress the limited water reserves, at a disadvantage for agriculture. Additionally, population growth, changing food consumption patterns and climate change are expected to intensify stresses. This calls for more efficient and sustainable irrigation technologies that are widely applicable. This project, Improving MEDiterranean irrigation and Water supply for smallholder farmers by providing Efficient, low-cost and nature-based Technologies and practices (MED-WET), provides solutions to enhance irrigation efficiency as well as to increase freshwater availability by tapping into non-conventional water sources.



During this project, three low-cost, lean solutions that optimise natural resource use and income even at small scales are explored. The "SLECI" (Self-regulating, Low Energy, Clay based Irrigation) technology is a self-regulating subsurface irrigation technique that uses the actual suction force of the surrounding soil for regulation of the system's water release via clay tubes. The second technology consists of a solar desalination greenhouse that will be used on saline and low-grade water to recuperate freshwater suitable for crop irrigation. Lastly, productive constructed wetlands are used for wastewater reuse and its transformation into reclaimed irrigation water.

Under this consortium, MCAST and the EcoGozo Directorate within the Ministry for Gozo are joined by the lead partner from Germany (Hochschule Wismar), as well as partners from Egypt (Heliopolis University for Sustainable Development), Morocco (Institut National de la Recherche Agronomique du Maroc and Sultan Moulay Slimane University) and Portugal (University of Beira Interior and Municipality of Fundão) during this 3-year project. MCAST are leading the capacity building and dissemination activities to maximise project visibility, accessibility and impact.

MED-WET is 100% funded by the Malta Council for Science and Technology through the PRIMA initiative of Member States, Associated Countries and

Participating Countries. The PRIMA Programme is supported by the European Union.

OVERALL AIM

MED-WET aims to improve the irrigation efficiency of small farmers in the Mediterranean region and to make optimal use of scarce water resources for lasting food and water security. This is being done, amongst others, by:

- *Developing new irrigation technologies and solutions widely applicable for smallholder farmers.*
- *Equipping smallholder farmers with knowledge and skills to install, adapt and operate more efficient and effective irrigation options.*
- *Increasing irrigation water availability from salinized and secondary sources.*
- *Enhancing farm profitability and environmental footprint of pilot farming practices.*

MAIN EXPECTED OUTCOME/S

MED-WET supports smallholder farmers to adopt low-cost, sustainable solutions in irrigation and freshwater harvesting, to promote controlled water use with increased crop yield, to implement agricultural methods that restore ecosystem services for the long term, as well as contribute to value creation in rural areas. Higher water use efficiency shall be reached through more targeted and highly decreased water consumption through innovative irrigation systems and tapping into largely unused non-conventional water resources.

RESULTS

WP1 involves project management and consortium coordination and is ongoing. Technology development and adaptation, as indicated in WP2, resulted in the development of pilot installation and monitoring plans. Ten pilot sites are currently in operation. The SLECI technology is being piloted in four sites in Morocco for the irrigation of date, olive and citrus trees, three sites in Portugal for the irrigation of peach and cherry trees, and two sites in Gozo for the irrigation of citrus and vines. Additionally, the constructed wetlands are being piloted in Egypt. Data collection is ongoing. Business development and stakeholder cooperation, as described in WP3, resulted in an environmental and policy analysis and a cost-benefit analysis. Impact evaluations, as mentioned in WP4, are ongoing with the evaluation of the results obtained from the pilot sites and comparison with existing irrigation solutions. WP5, led by MCAST, involves capacity building and dissemination. A communication and dissemination plan was developed. Several communication and dissemination strategies are currently ongoing, such as updating the project



website and social media channels, publication of articles for a non-scientific audience, distribution of project leaflets, participation in outreach activities, representation of the project during seminars, and communication with stakeholders.

IMPACT OF RESEARCH

MED-WET contributes to combating the adverse effects of climate change on water security, agriculture and food security in the Mediterranean. The project contributes towards the achievement of SDG 6 (clean water and sanitation), more specifically indicator 6.4.1 (change in water-use efficiency over time). MED-WET also contributes directly to SDG 13 (climate action), 1 (zero poverty), 2 (zero hunger) and 12 (responsible consumption and production). MED-WET supports the achievement of the EU Green Deal, including the 'Farm to Fork' Strategy, the Circular Economy Action Plan, and the New EU Strategy on Adaptation to Climate Change. By enabling diversification, promoting regenerative systems with enhanced water efficiency by design, and applying water recovery technologies that provide ecosystem benefits including habitats, MED-WET contributes to the European Biodiversity Strategy and international strategies, such as the UNEP plans on Biodiversity and Agriculture.

The direct impact reaches even beyond the Mediterranean via agrifood value chains reaching all over Europe and North Africa. Throughout the entire project, collaboration between EU and African partners and target stakeholders will facilitate cross-fertilisation of techniques, spanning cutting-edge technologies and sustainable traditional methods. In addition, business development and exploitation activities support each partner to bring their innovations to market, and to launch follow-up research and innovation activities. MED-WET will involve 200 students as researchers (early career, masters, PhDs), enable partners to disseminate in trade-press, trade-fairs, and conferences. Each of the pilots will also enable the creation of local innovation systems, local incubators of cooperation between science, end-users and finance providers bringing forth new business models for replication and further experimentation. MED-WET co-develops the local innovation systems in cooperation with end-users, as end-users directly provide inputs on needs, problems and possibilities of the technology under experimentation, and help articulate design specifications, while the field tests provide insights on unexpected side effects of new configurations, promoting real embedded sociotechnical transition.

MED-WET will increase profitability of smallholder farming by enabling them to significantly cut production costs. Enhanced water availability for irrigation and cost reductions resulting in funds freed for investment in the farm enable crop

diversification including the cultivation of higher value crops as well as equipment for improved post-harvest handling and increased ability to pay for certifications and other aspects enhancing access to market. MED-WET provides solutions targeted specifically at smallholder farmers in rural areas, thus the benefits of MED-WET for business competitiveness and growth contribute to inclusive rural development.

KEYWORDS

Agriculture, irrigation, nature-based, water, Mediterranean

Project MED-WET funded by the Malta Council for Science and Technology through the PRIMA initiative of Member States, Associated Countries and Participating Countries under grant agreement number PRIMA-2020-02A.



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The Malta Council for
Science & Technology

Modernizing Agriculture Knowledge and Innovation Systems (modernAKIS): a step into a 7 year journey

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² Agriculture Directorate (Malta)

BACKGROUND

In times of increasing pressure on the use and management of natural resources and high political and societal ambitions



with respect to sustainable ways of food production, the European Union (EU) has defined visionary goals (e.g. European Green Deal) to tackle climate change and sustain a healthy way of life. Within this context, the timely access and integration of rapidly evolving scientific knowledge, innovation and technological developments across actors who participate in agricultural value chains is key to a successful transition towards the European vision. This is also reflected in the 2021-2027 Common Agricultural Policy (CAP) that stipulates the importance of effective Agricultural Knowledge and Innovation Systems (AKISs). AKIS refers to the networks, organizations, and processes that facilitate the generation, exchange, and application of agricultural knowledge and innovations within a given agricultural system. Such a framework is supported by AKIS actors (i.e. actors from R&D institutions, advisory services, farmers/producers, policymakers, Agribusiness, private sector and NGOs) as well as physical and digital platforms that allow effective knowledge sharing and support innovation.

However, the AKIS concept is not yet widely known and the capacity of decision makers to implement this approach remains underdeveloped. Effective knowledge flows are often challenged by the diversity of AKIS systems at national/regional/local levels, and the decentralization and privatization of agriculture services (e.g. advisory services, education and training activities) contributing to an increasing pluralism of actors. Such challenges set the scene for the work undertaken by this project. With the involvement of a diverse range of partners from all 27 EU member states (including ministries, universities, chambers etc.) and spanning over 7 years (2022-2029) the project looks at making the AKIS approach an effective tool for all actors of agrifood systems. This abstract provides an overview of the project's objectives and its achievements during the project's first year.

OVERALL AIM

The project's main objective is to improve AKIS actors' capacities to leverage individual, organizational and systemic resources needed for the transformation towards more coherent and efficient AKIS systems and the transition towards the sustainable management and use of natural resources in farming and forestry. Throughout its first year the project has sought to initiate the processes aimed at building the AKIS network/groups of actors and the infrastructure which will sustain the AKIS systems throughout the project's lifetime.

MAIN EXPECTED OUTCOME/S

The main outcomes expected include: (i) the provision of a new know-how to be used by policy makers and other AKIS actors, to improve knowledge flows and develop a well-functioning AKIS in their country (ii) supporting Member States' benchmarking in order to choose the most effective AKIS interventions adapted to local/regional/national situations (iii) the provision of approaches to better connect actors, policies, projects and instruments to speed up innovation and the uptake of knowledge.

RESULTS

In order to support the achievement of project objectives MCAST has sought the support and collaboration of the Maltese entity officially designated with the role of AKIS Coordinating Body i.e. the Agricultural Directorate, this being the main local regulator of the agricultural sector. MCAST is in constant communication with this entity, ensuring timely consultation on technical matters (e.g. reporting on Malta's CAP Strategic Plan 2023-2027) as well as consideration and communication of the entity's needs as regards AKIS implementation (e.g. reporting of capacity needs assessment).

Recently, project leads have open invitations for actors to join the EU-wide modernAKIS network - a platform aimed at connecting AKIS actors, facilitating exchanges on AKIS practices in other EU Member States, as well as other specific topics of interest. By joining this network, members will benefit from capacity-building events and will also have the opportunity to contribute towards the design of the modernAKIS learning agenda and engage in networking events. The said platform is set to be launched in March 2024. MCAST has been networking with local actors with the aim of enhancing participation to the network. In this respect MCAST has also joining online sessions aimed at the co-design of the said platform. Furthermore, the project is gearing towards the setting up of country-based and cross-country Communities of Practice (COPs), these consisting of multi-actor sub-groups working towards supporting specific objectives or themes of interest to the wider AKIS network. As a first step, MCAST has attended a coaching session aimed

at training the designated COP managers and is discussing the workings of the local COPs with the Agriculture Directorate.

Currently MCAST is also conducting research and data collection required to support the analysis of specific aspects of the CAP Strategic Plans, as is being conducted under the project.

IMPACT OF RESEARCH

The project will achieve impact through an iterative cycle of collection-organization-delivery of new topical knowledge ready for practice. Key AKIS actors can access this knowledge through the knowledge exchange platform and apply it in their context to achieve better knowledge flows and thus a better functioning AKIS. Knowledge will pertain to AKIS models, strategies, governance solutions, and types of AKIS interventions beneficial to achieving CAP objectives. Network interactions will enable actors to draw on practice-oriented knowledge for integrating advisors and innovation support into the AKIS and incentivizing researchers to deliver practice-ready knowledge. Key AKIS actors in modernAKIS can draw from the comparative analyses of the 27 MS to understand where they can improve their AKIS. Subsequently they can extract and take advantage of new know-how and practices being experimented in AKISs models and strategies applied across the EU from the knowledge exchange platform. The project will enable the capacities of relevant coordinating bodies to monitor, measure and improve the organization/functioning of their AKIS. These activities will help them to identify, share and learn strategies and mechanisms for a well-functioning AKIS. The project provides a forum for such bodies to discuss and exchange knowledge on all aspects of systemic change management.

Scientific impacts include benefits to scientists and practitioners who aim to develop tools/enhance the management practices of complex socio-political ecosystems, especially with a focus on knowledge of management and actor networks.

Economic impacts are also expected through reduced systematic access costs for participants of AKIS. Further, the lessening of informational asymmetry is expected to incentivize the adoption of innovative and cooperative practices with individual pay-offs. Also, the benchmarking against better practices may trigger interventions which provide additional incentives and revenues for advisors, researchers, innovators.

Social impacts are also foreseen as the AKIS network will increase awareness, understanding, knowledge and capacities for system change of key AKIS actors. Long-term improvements in trustful relationships are also expected. Meanwhile by setting up an EU-wide network of key AKIS actors - building on existing networks,

projects and policies, modernAKIS will accelerate the uptake of innovative AKIS governance models interventions as well as of practice-oriented knowledge.

KEYWORDS

agriculture, agri-food, CAP Strategy, Communities of Practice



Funded by
the European Union

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Green Labs 4 VET

Louis Aquilina, Olivia Siino .

MCAST Erasmus+ Projects and Mobility Office

BACKGROUND

The response of learners, teachers and institutions following the successful completion of our first Greening project: Green VET 4 SDGs was overwhelming. We had the strong feeling that there exists a need for more teaching and learning about the environment and sustainability as there remains a large gap in knowledge, space and education in Malta around sustainability and environmental care. Therefore, all five-project partners, MCAST, EDU Alliance Limited, Sivitanideios Dimosia Scholi Technon Kai, Zetva na znaenje, CPIFP Pirámide, have come back together to create a project that exposes learners to practical Green activities within their curricula to achieve new Green skills and competences. We want learners to "learn by doing" while understanding how to act in order to safeguard the environment and how to recover and recuperate on factors that are negatively influencing our planet.

OVERALL AIM

The project is two-fold, creating Green labs in VET and developing an Online Green Creative Hub.

Green Labs in VET provide practical hands-on training for learners... literally learning by doing. The Green Labs in VET will be innovative working areas part of the educational institutions where learners and teachers interact to achieve new Green skills and competences and learn about greening and sustainability.

The Online Green Creative Hub encourages and gives access to learners and teachers from different communities to meet, share and work on Green initiatives there by improving their green skills and competences, aligning the learners to Green jobs and instilling a strong element of Green entrepreneurship. To help learners think and generate new ideas that can be turned into Green entrepreneurial jobs and opportunities.

Through both these initiatives, the project will create spaces and opportunities for VET learners and teachers to take part in developing their green skills so they can be implemented in their future work.



MAIN EXPECTED OUTCOME/S

This project hopes to fill a gap and provide opportunities for students in higher and vocational education to learn about sustainability in practical ways and have them implement these values and ideals in their field of study and own projects. It hopes to bring students, teachers and policy makers together through sustainable development.

RESULTS

As this project has not yet ended, and is at the beginning of its process, there are no final results.

KEYWORDS

VET, sustainability, Green Labs, education



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of the European Union

Green Labs 4 VET is a European Erasmus+ project with agreement number 2023-1-MT01-KA220-VET-000156845. This project is scheduled between March 2021 and February 2023.

Connecting VET schools and Industry 4.0 through 'Making'

Damian Brincat, David Mifsud.

Institute of Engineering and Transport

BACKGROUND

The emerging Maker Movement can support students in acquiring advanced digital competences needed by Industry 4.0. The maker activities are based on the same technologies used in the advanced manufacturing industries and the European Fab Labs should be used as testbeds for developing VET curricula focused on those digital competences (EC, Curriculum Guidelines for Key Enabling Technologies and Advanced Manufacturing Technologies 2019). Digital practices (3d printing, CNC machinery, robotics, etc.) promoted by Making movement in the last years are demonstrating to upskill young people with those digital competences, helping them access formal employment (and self-employment) opportunities. Thus, the project aims at supporting VET teachers in implementing maker-based activities for providing VET students with advanced digital competences, in line with the changes of Industry 4.0. The project aims at increasing the employability of VET students and synergies with advanced manufacturing companies.

The project aims at identifying the digital skills most requested by advanced manufacturing companies implementing I 4.0 technologies. Industry 4.0 technologies are considered by the European Union as horizontal technologies "enabling" multiple sectors that are expected to be decisive in tomorrow's economy (EC, 2019 Curriculum Guidelines for Key Enabling Technologies and Advanced Manufacturing Technologies). Despite the great potential of these technologies in supporting youth employment, there is a lack of appropriate and multidisciplinary curricula providing the related digital skills. This is identified as a key barrier also to the development of innovation and digital transformation (EC 2020 Youth Employment Support: a bridge to jobs for the next generation).

OVERALL AIM

The overall aim of the project is to enable VET educators teach the skills and competences needed by the future workforce working in advanced technological industries.

MAIN EXPECTED OUTCOME/S

- 1. A competence framework relevant for Industry 4.0 as identified by the partners.*

2. *A set of training modules for VET students aiming to support the achievement of advanced digital competences in line with the needs of Industry 4.0.*
3. *A MOOC to support VET educators deliver 'maker based' modules.*

RESULTS

A competence framework was written which identifies 178 learning outcomes divided in 15 main competence areas. These competence areas were aligned with VET curricula and transformed into eight most important worker profiles. A website was developed, and all the results of this project are being published and made publicly available for free.
<https://www.makemyfuture.eu/>

IMPACT OF RESEARCH

With this project, future VET students will be better prepared for tomorrow's advanced digital industry.
VET educators will be better equipped to instruct their students in areas which are most in demand.
The manufacturing industry will benefit from a better prepared workforce, who 'can hit the ground running' in implementing I 4.0 technologies and thus becoming more competitive.
The EU and local economy growth depends on the readiness of the workforce to adopt new, more efficient technological changes.

KEYWORDS

Industry 4.0, VET education, Erasmus +, Maker education, Digital skills



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of the European Union

MakeMyFuture – Improving Digital Competences for Advanced Manufacturing Industries through Maker Education is a Cooperation partnership in vocational education and training sector (KA220-VET) funded under the Erasmus+ programme.



autonomous application for information mapping scrApbook during the disseRtation journey (STAR)

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BACKGROUND

Undergraduates, especially students working on their final year dissertations, need to demonstrate a high degree of understanding of concepts and knowledge in their field of study. With the ever-growing corpus of human research, students are finding it ever more difficult to successfully link all the relevant knowledge to the problem being addressed. It has been demonstrated that using information maps (which may include literature review mapping in the form of publications but also other sources of information, e.g. videos, diagrams, and others) has positive benefits to the learning process. However, the creation of these maps is often challenging for a new researcher, takes valuable time and requires consistent effort in maintaining its relevancy with up-to-date information.

OVERALL AIM

The project's overall aim is to design and test an AI application that will automatically generate a scrapbook of research topic information, that can be moderated by a supervisor, categorised based on well-known learning style models, with the long-term aim of enhancing the student's dissertation journey and to explore the acceptability of the AI application amongst a purposive sample of research students and supervisors.

MAIN EXPECTED OUTCOME/S

Expected Outcome 1: It is envisaged that after the AI model is trained on a number of published materials, a preliminary autonomous AI application will be tested in the context of MCAST specific institutes' (Engineering and Information Technology and Communication) dissertation supervision.

Expected Outcome 2: Initial insights on the relevance of the automatically generated information and acceptability of the AI application will be sought qualitatively from the users of the system. Iterative insights will be sought and will constitute a viable evaluation of the success of the initial and subsequent stages of the project.

Expected Outcome 3: The increased knowledge and capacity obtained through this project through further collaboration amongst the research team to expand their research within the AI in education sphere.

RESULTS

This project is in its initial months and, therefore, results are still pending.

IMPACT OF RESEARCH

This project will address MCAST's AI strategy Initiative 2 Personalized Learning through Smart Content. This project also addresses one of the six national smart specialisation areas for the period 2021-2027 "Future Digital Technologies" and Malta's AI objective to convert into the "Ultimate AI Launchpad" encouraging the development, prototyping, testing and scaling of AI. Contributing to the evidence base in the digital sphere will also contribute to one of the European Green Deal's objectives, transitioning to a green and digital economy.

1. Education discipline: Students conducting research dissertations

Impact: Providing the first steps (TRL 4) of a tangible AI application to autonomously populate a list of relevant sources to a particular hypothesis/dissertation topic would provide a rewarding tool for students as they can use those research topics as sources to develop their discussions with their supervisors and peers, rather than spending significant time searching for those sources.

Impact: The proposed research could help both the student and the dissertation supervisor investigate alternative sources, which could include alternative methods of representation to facilitate the information mapping understanding process for students. The STAR application will be evaluated for its quality and acceptability with a purposive sample of both supervisors and students.

Impact: An autonomous application can find alternative sources that could include audio equivalents (e.g., webinars) to written papers that can allow for students with specific access difficulties to gain understanding of the information through other valuable generated sources.

Impact: The fact that the application is autonomous, if found to be successful, it could be implemented further to manage and monitor timelines in the dissertation process, with such a system sending reminders and generating generalized meeting requests based on the recommended schedule of dissertation supervision meetings. The interface could also effectively be used as a logbook to manage the dissertation process.

2. Education discipline: Dissertation supervisors

Impact: Reading and measuring data with respect to what sources are clicked and interpreted can also serve to improve the measurement and analysis of the process



of dissertation supervision, providing additional information that may help supervisors improve the quality of the supervised dissertations.

3. Computer and Data Science discipline

Impact: An autonomous application will push the boundaries of AI because the quality of the classified sources will provide for an analysis of the methods of generative AI that can provide useful information on how AI can autonomously provide relevant links presented in different methods.

KEYWORDS

Artificial intelligence, dissertation, education, research, technology.



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**TECHNOLOGY
DEVELOPMENT**
PROGRAMME

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Intelligent Inventory - Using data to predict inventory safety stock in Industry

Stephane Role

MCAST Institute Engineering & Transport

BACKGROUND

Industry is continuously on the lookout to streamline their supply chain processes, especially considering the recent disruptions in global supply chain due to the pandemic and war in Ukraine. After discussions with local industry it has become clear that calculating safety stock levels is one of the leading hardships that industry in Malta face today. This is due to the high cost of storage space in tandem with the high cost of shipping. It is imperative that companies manage to find a balance between these two costs while maintaining customer demand to a satisfactory level. 'Deep learning' and 'Big data' are terms used in industry to refer to the challenge of making sense of large amounts of collected data with the scope of process improvement. We proposed to make use of algorithms and techniques from this field to leverage data to guide decision making while setting these safety stock levels.

Specifically this project is looking into issues brought forward by Methode Electronics Malta Ltd. From the preliminary investigation into Methode's processes and data, the need for dynamic safety stock controls was identified as a major area for improvement that could reduce cost. Currently, the company makes use of a fixed inventory system that can be edited manually, however, it has been proposed to update the system using a predictive AI model that can advise the company to change inventory stock depending on external global factors and seasonal trends.

OVERALL AIM

Given recent global events such as the Covid pandemic and war in Ukraine, industry is facing an ever-growing challenge in maintaining lead times due to delays within the supply chain. In line with the emerging Industry 4.0, this project aims to leverage artificial intelligence (AI) to mitigate some of these issues by predicting disruptions before they impact supply. Data from external sources and data gathered from local industry can be used to make these predictions and calculate the necessary inventory/stock parameters to minimise lead times and give local industry a competitive edge in today's market.

MAIN EXPECTED OUTCOME/S

It is expected that a relationship between the day to day actions of a corporation and global supply chain events exists. This project tries to learn and model this relationship to improve a company's ability to take decisions based on large

quantities of global data. We hypothesise that a model should be capable of doing this given that the data is accessible and available.

IMPACT OF RESEARCH

Chapter 5 of the Malta AI Strategy highlights the importance of private sector adoption. This project contributes to all the points discussed in this strategy. The strategy describes the following sections of interest:

Raising AI awareness in the industry – The project will demonstrate real tangible benefits of AI adoption in the private sector. This can be leveraged for future projects, and to raise awareness with other companies to implement similar systems based on their data.

Identification of improvements that can be made through AI – This exercise has been carried out with Methode Electronics Ltd. A use case of AI has been identified with the support of their supply chain team.

AI-ready index – The project will contribute to the AI-ready index at Methode, increasing their AI-ready index and promoting AI as a solution to other industries.

Implementation of AI solutions – The focus of this project is on the implementation of an AI in a real-world application solving the realities these companies are facing.

Building trust in AI, transparency and accountability – The project will create a consultancy-based system to build up trust with the personnel involved. Additionally, the research team will be training the end-users at Methode on the nature and mechanisms behind the AI's decision making.

KEYWORDS

AI, supply chain, industry 5.0, Machine learning

Enhancing Vocational Programming Education through Gamified Digital Learning: The GOLEM Initiative

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MCAST Institute of Information & Communication Technology

BACKGROUND

In recent years, the rapid evolution of digital technologies has significantly impacted the educational landscape, necessitating a paradigm shift in teaching and learning methodologies, especially in Vocational Education and Training (VET) sectors. Among the disciplines, programming education is pivotal, forming the backbone of the burgeoning digital economy. However, conventional teaching methods often fall short in engaging students and fostering a deep understanding of programming concepts.



Amidst this backdrop, the GOLEM Initiative emerged as a visionary project under the Erasmus+ program, aiming to bridge the gap between traditional pedagogy and contemporary educational needs. The acronym GOLEM, representing Gamification Of Learning in vocation Education using Minecraft,

encapsulates the project's innovative approach to melding gamification with programming education in VET settings. Leveraging the interactive and immersive nature of the popular programmable video game Minecraft, the initiative endeavors to transform the classroom experience into a dynamic, hands-on learning journey.

The genesis of the GOLEM Initiative is rooted in the broader objective of enhancing digital literacy and elevating the quality of vocational programming education across the European Union. It acknowledges the imperative of evolving educational methodologies to resonate with the digital-native learner demographic, ensuring that vocational programming education remains relevant, engaging, and effectively prepares students for the digital demands of the 21st century.

Through a collaborative framework involving various educational institutions and stakeholders, the GOLEM Initiative is meticulously designed to address the

contemporary challenges in vocational programming education, offering a novel, gamified learning model as a viable solution to invigorate the learning experience and better equip both educators and learners in navigating the digital age.

OVERALL AIM

The overarching aim of the GOLEM Initiative is to revitalize vocational programming education by incorporating gamification, utilizing Minecraft as a pivotal tool. This project endeavors to transcend traditional teaching methodologies, fostering a more engaging and interactive learning environment. By developing a comprehensive training kit for educators, the initiative seeks to equip them with the requisite resources and methodologies for effectively integrating gamification in classroom instruction. Ultimately, the GOLEM Initiative aspires to enhance digital literacy, elevate the quality of vocational programming education in the EU, and better prepare students for the digital demands of the modern workforce, thus contributing to the broader educational and economic objectives of the European Union.

MAIN EXPECTED OUTCOME/S

- A well-rounded training kit for educators, facilitating effective integration of gamification into programming instruction.*
- Enhanced engagement and interactive learning experiences for students, promoting better comprehension and retention of programming concepts.*
- Improved digital literacy among vocational students, preparing them for the digital-centric modern workforce.*
- A sustainable model of gamified learning that can be replicated and adapted across various vocational education settings within the EU.*
- Stronger collaboration and knowledge exchange among educational institutions, fostering a community of practice dedicated to advancing innovative teaching methodologies in vocational programming education.*
- Contribution to the broader goal of elevating the quality of vocational education, aligning with the evolving educational and economic demands of the EU*

RESULTS

- Educational Resource Development: The creation of a comprehensive training kit for educators is a tangible result that provides a robust tool for enabling the integration of gamification in classroom instruction. This kit is expected to serve as a blueprint for educators to effectively engage students in interactive and hands-on learning experiences.*
- Improved Student Engagement and Learning Outcomes: By harnessing the interactive environment of Minecraft, the initiative is set to foster enhanced*

engagement, thereby improving learning outcomes. Students are likely to exhibit better comprehension and retention of programming concepts, translating to improved academic performance.

- Digital Literacy Enhancement: The gamified learning model is expected to significantly bolster digital literacy among vocational students, aligning them with the digital demands of the modern workforce.

- Replicable Model of Gamified Learning: The initiative aims to establish a sustainable and replicable model of gamified learning that can be adopted and tailored across different vocational educational settings within the EU.

- Collaborative Educational Ecosystem: Fostering a collaborative ecosystem among educational institutions, the initiative facilitates knowledge exchange and the dissemination of innovative teaching methodologies, contributing to a community of practice dedicated to advancing vocational programming education.

- Alignment with EU Educational Objectives: By elevating the quality of vocational programming education, the GOLEM Initiative is poised to contribute significantly to the broader educational and economic objectives of the European Union, showcasing a viable pathway to melding interactive digital learning with vocational education.

IMPACT OF RESEARCH

Pedagogical Advancements: The initiative introduces a novel approach to teaching programming by leveraging gamification. This could inspire a shift in pedagogical strategies, encouraging the adoption of interactive and engaging teaching methodologies across the vocational education sector.

Enhanced Learning Experiences: By creating a more engaging and interactive learning environment, the initiative is likely to enhance the learning experiences of students, leading to improved comprehension, retention, and application of programming concepts.

Digital Literacy Promotion: The project promotes digital literacy, a critical skill in the modern world, ensuring that vocational students are well-prepared to navigate the digital landscape of the contemporary workforce.

Educator Empowerment: The provision of a comprehensive training kit for educators empowers them with the resources and methodologies needed to effectively implement gamified learning, thus enhancing their teaching efficacy.

Community of Practice: By fostering collaboration and knowledge exchange among educational institutions, the initiative contributes to the development of a community of practice dedicated to advancing innovative teaching methodologies in vocational programming education.



Scalability and Replicability: The creation of a scalable and replicable model of gamified learning provides a blueprint that can be adapted and adopted across various educational settings, potentially leading to a wider dissemination and implementation of gamified learning approaches.

Alignment with EU Objectives: The initiative aligns with the broader educational and economic objectives of the European Union, showcasing a viable model for enhancing vocational education quality and relevance in the digital age.

Economic and Societal Contributions: By better preparing students for the digital demands of the modern workforce, the initiative indirectly contributes to economic growth and societal advancement, as a digitally literate workforce is crucial for innovation and competitiveness in a globalized economy.

KEYWORDS

Gamification, Programming, Minecraft, Pedagogy, Education



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EQVEGAN

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BACKGROUND

The vegan food industry is growing with new processes and technologies applied to plant-based products as a result from the consumer trend towards more sustainable and healthy diets. The food industry is expanding in plant-based products including products that did not exist before and can only be classified by the NACE codes as "others", such as in "10.39 Other processing and preserving of fruit and vegetables" and "10.89-Manufacture of other food products n.e.c.". Such products are, for example, cereal or nut drinks. Additionally, the increased sustainability requirements, and digitalization and automatization trends, are quickly changing the working environment and place a stress on the developing of new up-to-date skills of workers.



The manufacturing sector is responsible for more than 35 million jobs in EU, with the food industry being responsible for 13.4% of these jobs. Food Drink Europe reported an increase from 4.57 to 4.72 million employees from 2018 to 2019, in an industry characterized by a small number of employees per company.

The EU Skills Panorama report confirms that there are recruitment difficulties for jobs in food processing, partly because employers see a lack of technical skills. Low salaries and a lack of both technical and soft skills are reported as the main causes of these recruitment difficulties. However, it does not refer sectors affected by this plant-based promoted change, that is perceived by the food industry and other stakeholders that the partners of the EQVEGAN consortium represent. The same report observes that technology used in the production and maintenance of food is also rapidly evolving, based on an "increased specialisation in the use of materials, tools, processes and designs".

OVERALL AIM

The aim of the EQVEGAN project is to support the fast-changing sub-sector of the food industry and the processing of plant-based products, by responding to the urgent needs of training staff to support this change, by upscaling staff competences and facilitating the conversion of staff and this bridging this skills gaps.

To achieve this aim, EQVEGAN established the following objectives:

1. Supply innovative and scientifically updated training material.
2. Qualify trainings with quality assurance embedded principles.
3. Create a European certification scheme for trainings and job profiles.
4. Establish a Sector Skills Alliance on training for the vegan food industry.

MAIN EXPECTED OUTCOME/S

1. Development of 16 training modules for professionals and students on plant-based processing technology, soft skills, digitalisation and automation, and green skills for EQF levels 4, 5, 6 and 7.
2. Develop training for trainers in the same modules.
3. E-learning platform with OER materials
4. Guidelines for apprenticeships in the food industry based on EFQEA
5. Development of a European certification scheme of job profiles for the vegan food industry.
6. Create a stakeholder's database for the vegan food industry.
7. Create a skills and employability portal for the vegan food industry

IMPACT OF RESEARCH

Overall, the expected project impact is in having better prepared professionals in the vegan food industries, either at the subject specific level (vegetables, fruit, nut and cereal processing), but also in updated skills in automation skills, green skills, and soft skills, to more quickly support the growth and appearance of new VFI companies, providing a fast adaption to the new market demands, thus also correcting skills gaps.

Regional/national levels: During the project trainers will be trained at the countries of the partnership where education and training providers and associations that deliver training are present. Trainers will also expand the project impact, during and after the project end. Trainings during the project will develop skills of professional and students and translate in improvement in employability and performance at the job.

European/international level: The composition of the consortium, plus the tools to be developed, in particular the certification, assure an EU and international impact on mobility of professionals. Additionally, the dissemination through each



EQVEGAN partner network, in particular of IFA, assure expanded impact worldwide. The Sector Skills Alliance will be at the disposal of interested parties to replicate training in other countries or to support other countries institutions to implement EQVEGAN training there. The fact that the materials will be available in several languages, will help its use abroad, particularly: Portuguese in Brazil and some African countries, and French in Mediterranean and some African countries. Sectoral qualifications, mainly disseminated by EQA in the network of qualifications agencies, will lead to updates in its frameworks to improve qualifications and mobility of professionals.



KEYWORDS

vegan food industry, green skills, food processing



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**MCAST
RESEARCH & INNOVATION
EXPO 23**

***A SELECTION OF CONCLUDED
PROJECTS***



MCAST



CONCLUDED PROJECTS

Religious autonomy-support and Children's Prosociality

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BACKGROUND

Young children's capacity for prosocial behaviour develops with age, where children grow into agents of prosocial behaviour (Chernyak & Kushnir, 2013). The age between three to six years is crucial to the development of children's outgroup attitudes (Nesdale et al., 2004). Research about targets of prosocial acts, points to the role of outgroup attitudes, e.g. for refugee children (Glen et al., 2020). Studies have shown that age is related to ingroup symbol preference, and ingroup symbol preference is related to negative outgroup attitudes which in turn influence outgroup giving (Shamoa-Nir et al., 2020). Thus, more is known about the moderators of this study and less is known about the predictors of prosocial behaviour at this age group such as parental religiosity (for a review, see Zammit & Taylor, 2023). Although different religions are associated with helping behaviours (Ahmed, 2009, Norenzayan & Shariff, 2008, for a meta-analysis see Shariff et al., 2015), empirical research has shown that not all forms of religiosity (e.g. intrinsic vs. extrinsic religious motivation) are linked with prosocial behaviours (for a review, see Oviedo, 2016). Studies on religious autonomy are scarce but Hand (2017) calls on parents "to foster religious autonomy rather than religious faith" (p. 11) and encourage children to question moral standards so that they subscribe to a faith by choice not by pressure.

OVERALL AIM

This study examined the role of parental religious autonomy-support on 3-to-6-year-olds costly resource distribution towards both ingroup and outgroup children, as well as for parental reported general prosocial behaviour.

MAIN EXPECTED OUTCOME/S

Grounded on the Self-Determination Theory, this study hypothesised that for older children, their outgroup attitudes and ingroup symbol recognition would moderate the relationship between parental religious autonomy-support and outgroup prosocial resource distribution.

RESULTS

The results revealed no significant moderating role of ingroup symbol recognition. The only resulting significant relationship was the direct relationship between religious autonomy-support and general prosocial behaviour (supporting H3). The interaction of age, outgroup attitudes and religious autonomy-support on general prosocial behaviour was near-significant ($b = -0.016$, $t = -1.893$, $p = 0.058$), slightly supporting H4b and the non-significant prediction of H7 and H8. This means that the relationship from religious autonomy-support to general prosocial behaviour might be weakened by the interaction of outgroup attitudes and age.

IMPACT OF RESEARCH

Our findings provide valuable insights into the dynamics of religious upbringing, intergroup relations, and their combined impact on prosocial tendencies for this age group. In the context of religious upbringing, this might indicate that when children are provided with choices and feel that beliefs and practices are not imposed, they might be more inclined towards prosocial actions. Considering the emphasis placed on symbols in religious teachings and practices, our findings suggest that symbol recognition alone is not sufficient to alter behaviour. Moreover the current study and other studies on the role of outgroup attitudes emphasise the complex interplay of individual upbringing (e.g. religious autonomy-support) and broader societal influences (outgroup attitudes) in shaping children's prosocial behaviour. In divided societies, fostering an acceptance of outgroups becomes more paramount compared to societies with no conflict. Moreover, the near-significant interaction might indicate that as children grow older and develop more pronounced outgroup attitudes, the positive effects of religious autonomy-support on prosocial behaviour might change to incorporate intergroup relations.

KEYWORDS

early childhood, prosocial behaviour, religious autonomy-support, symbol recognition, outgroup attitudes

Development of the Entrepreneurial Mindset Curriculum

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MCAST Applied Research and Innovation Centre

BACKGROUND

HEIght, is an initiative of a pan-European consortium of four forward-thinking higher education institutions (HEIs), namely MCAST (Malta), UCLan UK (UK), UCLan CY (Cyprus) and Özyeğin (Turkey) and one actor from another side of the Knowledge Triangle, the National Centre for Entrepreneurship in Education (NCEE) UK, united to cultivate a mutually beneficial and collaborative consortium. It leverages existing innovation and entrepreneurial knowledge of all the partners and draws on the resources of HEInnovate to spur on growth of the sustainable innovation in our communities and in our institutions. HEIght delivers on our shared vision of prosperous, inclusive and climate-resilient societies where food systems and other areas of human activity that are sustainable, trusted and healthy contribute to net zero carbon emission economies through a structured programme of work packages. Through training, designed and tailored to developing innovation and enterprise, these activities support the development of academic and non-academic staff and students. Across two phases, HEIght achieves KPIs of delivering training (including mentoring) to students, academics and non-academics in order to build innovation and entrepreneurial capacity within HEIs across the consortium, EIT HEIs, the EIT KICs and into society. Sustainability is achieved through enabling lifelong learning, particularly through the development of Communities of Practice which can grow from the consortium to pan-European Member States.



OVERALL AIM

WP5 of the HEIght project is dedicated to developing and piloting innovative learning materials and methodologies for students to enable them to be a sustainable entrepreneur and provide them further skills to bring innovation into the market addressing complex problems such as Climate Change.

MCAST led locally the introduction to systems innovation tools and challenge-based learning in level 4 students.

MAIN EXPECTED OUTCOME/S

Ultimately the aim is to embed Innovation and Enterprise across programmes of study for staff and students. While the role of HEIs in fostering entrepreneurship and innovation communities is widely acknowledged and frequently studied (Vick

& Robinson, 2018), the innovation inside HEIs often face significant barriers. HEIGHT project aims at overcoming this barrier by leaning on the results of the HEInnovate self-assessment and other resources available to the consortium.

RESULTS

System innovation is a horizontal policy approach to use combined technologies and social innovations to tackle problems that are systemic in nature, such as Climate Change or the transition towards net-zero carbon economies. System innovation involves the engagement of many different actors, from both the public and private sector, which directly affect the innovation in this complex area, taking a long-term view approach. Learning how to manage complexity can be the first step towards a different problem-solving approach based on a deeper analysis and understanding of the challenges we are facing.

A training module was delivered in MCAST, based on the challenge-led approach with a collective problem-solving perspective, as originally devised by the Climate KIC Transitions Hub to address transitions to sustainability in socioeconomic systems. EIT Climate-KIC has widely applied elements of system innovation and transition management by combining other general project and innovation management elements. In particular, this mindset approach has been transferred via Climate-KIC's educational programs such as Pioneers into Practice and Young Innovators, from which the development of this module drew knowledge and experiences.

HEIGHT project's training modules resulted in 2 training guides for educators, one designed by UCLan-Cyprus and one from MCAST. MCAST delivered on a training guide for educators on systems thinking visual tools.

Challenge-based learning uses a challenge as a starting point to explore a complex system in a multidisciplinary, project-based and problem oriented approach. An introduced challenge should be of a real problem, preferably reflecting students' concerns, as this will make them more eager to engage. As sustainability has gained a central role in all aspects of societal, political and economic development and forms an integral part of this module, it is strongly suggested that a climate challenge is presented. A challenge can be provided by a challenge owner (which can be a local government official or a private entity presenting a present challenge they are facing and in which they seek solutions) or can be constructed by the educator/facilitator, as long as it reflect a real-life and climate related problem. By using a challenge in such a way, students will gain knowledge on a present problem, understand the system in which this challenge exist and the complexity of the connected elements that comprise it.



The use of visual tools is an important educational aid, as it can break the monotonousness of a lecture while building a number of skills. Additionally, visualisation in the learning process can help better identify and understand the interdependencies of an explored system, by drawing connection and creating new ways of communication, while boosting creative and critical thinking. Visual tools make the learning process easier and more interesting for students, as with their use, they actively participate in the learning process.

The entire methodology is based on active and experience-based learning. Learning outcomes should stem from the students' work. The educator/facilitator, acts as a guide to help nudge the students in the right direction when they get stuck. For the implementation of this module, students are required to work in teams and access to resources should not be restricted (physical books and journals, teaching handbooks and online resources should be available). The access to information is imperative in the process, as the students are expected to find information and produce the knowledge of the course through their work and interactions. Working in teams helps in exploring and understanding different perspectives, exchange of knowledge between peers, critical thinking and feedback and eventually lead in a multidisciplinary approach of a system recognition.

IMPACT OF RESEARCH

The Applied Research and Innovation Centre (ARIC) of MCAST, with contributions from Attila Katona of Center for Systems Innovation, developed this guide with Visual Tools, based on Young Innovators Programme and Transitions Hub Series tools by EIT Climate-KIC, for the introduction of Systems Thinking and Sustainability in the MCAST curriculum. The guide is the output of HEIGHT project, funded by EIT Climate-KIC and comes upon piloting System Thinking Innovation Visual Tools in different settings, including in MCAST's Level 4 Employability and Entrepreneurial Skills Unit in 2022-2023. The suggested exercises are aimed at facilitating the development of key skills, such as, Systems Thinking, Problem Solving, Creative Solutions, and Critical Thinking. It is based on Challenge-led learning, where students are invited to have an actively participatory role in their education.

The tools introduced are designed to help students understand what a system is and how it works. All elements in a recognised system are interconnected and interdependent. A change introduced to one element will create a domino effect, affecting all connected elements and be affected by changes in other elements. Thus, a system is in constant movement. Using visual tools to analyse and interpret these systems will help students develop their cognitive and mapping skills. The purpose of using visual tools should be clearly explained at the beginning, so that students can understand the purpose of participation and practice. At times, using

these tools and drawing technics might seem like children's' game rather than a lesson. The method is meant to be fun and interactive, so that students can engage more willingly and make acquiring knowledge a type of game rather than an long sitting in a lecture. Interactions among students are welcome, as long they remain on topic.

The tools are designed to aid in the systemic understanding of problems and challenges. Understanding the system within which a challenge is embedded, will help in identifying the strand of the system that could have the biggest impact in the whole system, should a change be introduced to it. Hence, having recognised the System, students can work in a targeted solution that will expedite a sustainable transition of the whole system. A system mapping activity can be repeated or reverted to several times during the process, while it serves as good self-assessment exercise for the teams to identify how their proposed solution can impact the system they work in. The same applies to any mapping activity, as the map can act as a valuable assessment tool for the teams.

Learning Outcomes & Implementation Results

Systems thinking & Problem solving, Critical & Creative thinking, Innovation and entrepreneurship skills, Team work, Healthy competition, Public speaking/pitching ideas

The described guide is the result of the transferability of deliverables of HEIGHT project and is to assist lecturers, primarily but not exclusively, in MCAST to facilitate Systemic Thinking and Entrepreneurial Skills for students. The guide is available to lecturers who want to make use of the tools.

KEYWORDS

Entrepreneurial Universities, Innovation, Education, Challenge-led learning, Systems Thinking

Supported by



How do Innovation Hubs help Start Ups Exploit and Expand Business Opportunities? MITA: Case Study

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BACKGROUND

Several researchers (Chirchiotti, 2017, Etzkowitz, 2003, Jimenez, 2016) in the field of innovation and entrepreneurship have highlighted the role that innovation hubs play within the various stages of entrepreneurial process since they aid start-ups during their entrepreneurial journey, thereby also enhancing economic growth. Within the current economic climate, the development of innovation hubs is considered essential in fostering an entrepreneurial spirit, mindset, and strategy (Hassink et al., 2019, Pike et al., 2016). In fact, innovation hubs are renowned to play a pivotal role in the foundations of a start-up environment. Furthermore, According to Youtie and Shapira (2008) innovation hubs are essential in fostering appropriate networks essential in the exchange of tacit as well as codified knowledge.

OVERALL AIM

Even though there is a vast body of knowledge on the relevance of innovation hubs, to date, there is a lack of research on this topic specifically related to the realities of the Maltese market. Hence the aim of this study is to utilize a case study approach on a local innovation hub to examine this gap in the research. Even though it has now ceased its operations, the MITA Innovation Hub (MIH), was launched in May 2014 with the aim of stimulating entrepreneurship and innovation for various start-ups through the implementation of diverse programmes targeting the different needs of the start-up stages.

MAIN EXPECTED OUTCOME/S

MCAST, being the largest vocational educational institution locally, has been tasked with fostering innovation and an entrepreneurial mindset within its student population, as outlined in its strategic plan by providing "more entrepreneurial exposure to students through different initiatives such as the updated MCAST Entrepreneurship Centre" (p.32). This theme is also highlighted through the delivery of two Entrepreneurship cross curricular key skills units delivered at L4 and L6. However, even though MCAST recognizes the importance of generating innovative ideas and fostering an entrepreneurial mindset within its student population, there is still a gap on how these ideas can be implemented outside of school boundaries. Therefore, this study also aims to add knowledge on the

importance of innovation hubs within the current local educational framework, thus extending the literature on this topic.

RESULTS

Through the case study of the former MITA innovation hub, it can be postulated that the main aspects for a successful innovation hub are its location, tangible and intangible resources and human capital. Furthermore, various initiatives originating from the public and private sector also play an imperative role in the development and running of these hubs since they contribute in the creation of an innovative and vibrant entrepreneurial ecosystem.

IMPACT OF RESEARCH

Education-Industry- Government: Partnerships for Innovation:

The Triple Helix Model described in this study is a framework that discusses the interplay between government, industry, and academia in promoting innovation and economic development. The model suggests that these three sectors can collaborate to create a virtuous cycle of innovation by combining the resources, expertise, and incentives of each sector (Chowdhury et al. 2021, López-Rubio et al. 2021). Following analysis of the data obtained in this study, one can argue that innovation hubs can play a key role in implementing the Triple Helix Model by bringing together the three sectors and fostering collaboration between them.

The findings from this study also outlined that the role of government in innovation hubs can vary depending on the specific context, but generally it can be divided into two main categories: policy making and funding/support.

Innovation Hub Suggestions within a VET institution:

- Space: area chosen should be easily accessible to all students, with specifically designed co working spaces as well as having a separate area where talks, seminars and other educational material can be delivered to larger crowds.*
- Availability of resources: students should be given free access to resources normally accessible in an office environment which is necessary to perform administrative tasks and duties.*
- Specialized mentorship is offered to help students develop and implement their business plan. It has been suggested that this training would be best delivered through a workshop format from industry specific experts*
- Hosting of networking and dissemination events*
- Provide seed funding, which can also come from external stakeholders.*
- Provide incentives for local organisations to exploit collaboration with start ups enrolled within the innovation hub.*



- *Co-operation between MCAST, other educational entities, research centers and local entrepreneurial communities*

KEYWORDS

Entrepreneurship, Innovation Hubs, Case Study.

Re-thinking the teaching of mathematics: COVID-19 and beyond

Marouska Zahra Micallef

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BACKGROUND

The COVID-19 pandemic has brought on drastic shifts in teaching, forcing a rapid transition from face-to-face to online learning spaces, with schools adopting new modes of pedagogy and assessment. Educators were faced with a situation where they needed to relearn ways of teaching mathematics, and reimagine possibilities for teaching mathematics within the constraints imposed by the pandemic. In spite of the difficulties, these constraints gave rise to innovative ways of teaching mathematics, and provided an opportunity for teachers and students to find new ways of interacting and working together.

OVERALL AIM

With a focus on the teaching of mathematics at post-secondary level, this paper explores the teaching experiences of four lecturers during the COVID-19 pandemic. It looks at the emerging pedagogical realities as the lecturers adjusted their teaching practices, as well as the pedagogical insights that they have gained for their future practice.

MAIN EXPECTED OUTCOME/S

The research study will provide data on the experiences of a sample of mathematics lecturers teaching during the pandemic as well as insights on the future of mathematics teaching post-pandemic.

RESULTS

While initially the lecturers attempted to replicate a teaching and learning environment similar to what was before the pandemic, remote teaching then led to searching for digital tools that sought to enrich the teaching and learning experiences and afforded new opportunities for teaching and assessing mathematics. Following the period of remote teaching, the lecturers look towards a future practice as one which involves a blended learning approach, utilising aspects of online teaching and technology to complement and enrich their face-to-face teaching. The pandemic and remote teaching should provide impetus to the sharing of pedagogical practices and to effective professional development on the use of effective teaching approaches, including the use of digital tools, to enhance the mathematical teaching and learning experiences for students.



IMPACT OF RESEARCH

This research study has been part of a personal reflective journey on my own pedagogical practices during the pandemic and on how the learning experiences of my own students can be enhanced. The participants' experiences and insights about future practice can also inform policy and practice within MCAST and beyond.

KEYWORDS

Mathematics pedagogy, COVID-19, teaching mathematics, MCAST, blended learning

An exploration of student biographies in Higher education: A narrative inquiry

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BACKGROUND

The research is set within the context of a Vocational and Educational training college (MCAST). It is a study that is a part of a research project initially concerning three studies. This is part two and so builds on part 1, where the role and function of chaplaincy MCAST were studied.

Out of this initial study themes emerged, which became the building blocks to understand how young people in MCAST understand and interpret these themes, which are the backbone and the purpose of why the MCAST chaplaincy exists.

OVERALL AIM

The primary goal was to establish a comprehensive understanding of the term "youth ministry". As stated in the Salesian Framework for Youth Ministry (2014), this is the foremost way of embodying Salesian values and effectively engaging with young people. By understanding the voice of young people in MCAST, therefore, the Salesian chaplaincy would be in a better position to strengthen the initial proposals made.

MAIN EXPECTED OUTCOME/S

The project will be completed once a model for the Salesian youth ministry within MCAST can be elicited scientifically. This study is a second part and so by understanding the voice of young people, the chaplaincy will further consolidate its initial proposal with what else continues to emerge from the research projects being undertaken.

RESULTS

The results showcased where young people find themselves, given that his 'new' generation of Genzers is emerging from a pandemic. They come burdened with a baggage that oftentimes prevents them from reaching their life dreams.

The results indicate that young people are enthusiastic about being able to go further with the necessary help. Overall, and aside from the sometimes traumatic pasts, students are resilient to know how to care for themselves, also acknowledging the importance of an adult presence in their lives. This could take on many forms, from family, professionals, coaches, and so on to open them up to

new opportunities that could only be discerned through practice wisdom, or through the passage of time.

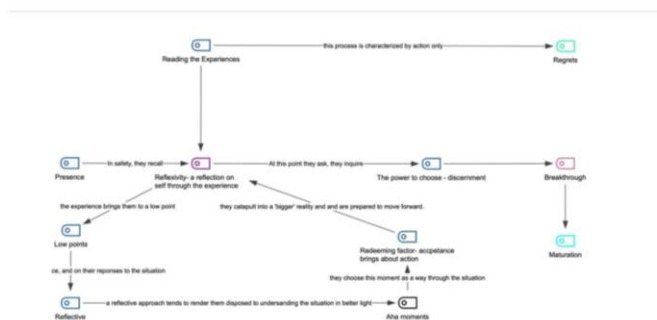


Figure 4: Aspects revealing reflexive or non-reflexive attitudes that led to moments of satisfaction or regrets when emerging from a crisis.



Figure 5 A model on how participants perceive moving onwards from childhood experiences with their lives as adolescents.

What also became evident was the values by which they discern life. This seems to be a strength in them that permits them to perceive a way out of childhood traumas and to peek into a future life unscathed. The power of the internet also gives young people access to form new bonds, where the geographical boundaries limit them and sometimes could be the cause of prejudice and suffering. Finally, an enriched version of themselves seems apparent in young people given that they have the power to choose and the tools to achieve. So what seemed like a pressing need was that of building strong ties with those they choose to engage with.

IMPACT OF RESEARCH

The saying 'it takes a village to raise a child' seems to sum up the impact that research like this could have on society. Beginning from the institutes that aim to develop the potential of young people, to teachers in classrooms and beyond, this research has a bit in it for every individual or organization that works with young people.

This study focuses on the personal development of young people, however, young people are involved in their studies in a very personal way, making their learning journey their own and so, starting from where the young person is, will contribute to the quality of education that MCAST offers its stakeholders. Preparing them for industry also requires them to be healthy beings, apart from being job-ready with the necessary skills required for the job.

With loneliness on the increase, sometimes escalating to situations of suicide, young people have suffered childhood trauma and when they thought they were getting ready for the real world were set back by a pandemic. They stand little chance of being independent unless first they are cared for. They are required to grow into autonomous adults who can make adult decisions and who are not preoccupied by the fears and anxieties of exiting from their eco-chambers. However, to do this, they require to be prepared and service-ready, to dream of a brighter future for themselves. A safe presence around them, to understand them, and to spur them on can send them a long way.

KEYWORDS

Young people, Youth ministry model, student concerns, vocational educational training institution, personal development.

The Fun Fit 5 (FF5) Project - A Study of a Daily Physical Activity Programme in Primary Schools in Malta

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BACKGROUND

In the context of increasing awareness of the benefits of regular physical activity, and political will expressed during the build-up to the 2022 general elections by virtue of an electoral promise concerning daily physical education lessons in schools, a pilot project was carried out over the 2022/23 academic year to provide daily physical activity (PA) sessions in Maltese public primary schools. In conjunction, an extensive research project was carried out to investigate reactions, processes and outcomes surrounding the implementation of a daily PA programme among grade four students in three Maltese state schools. The project itself was organised and delivered by the Malta Football Association (MFA), while the research study was carried out by a team of four researchers at the Malta College of Arts, Science & Technology, and one from the MFA. Regular physical activity is commonly assumed to have a positive impact on the holistic development of children and is generally presented as a justification for the inclusion of structured, formal PA programmes in educational settings. There are, however, few studies that have rigorously investigated the effects of daily PA in real-world school settings, both locally and internationally. There exists, therefore, limited evidence to support policies aimed at making significant changes to the daily routines of primary school children in the name of systematically increasing PA.

OVERALL AIM

The aim of the study was to explore the effects of a daily PA programme in Maltese primary schools across three domains and from various perspectives. An experimental design with quantitative measures of academic, physical and life satisfaction metrics was implemented with a view to ascertaining the presence of significant effects due to the treatment of daily physical activity sessions. The main outcomes of interest were, in the academic domain, performance on Maltese, English, Maths, Science and general reasoning tests. In the physical domain, body mass index, running speed, skill at locomotion and ball skills. In the life satisfaction domain, satisfaction with family, friends, school, living environment and self. Interviews, focus groups and observations were also carried out as part of a broader design to explore the perspectives of all the main stakeholders party to

the project, including the students, members of the school leadership team, educators, parents and coaches.

MAIN EXPECTED OUTCOME/S

The research project will culminate in a detailed official consultative report, as well as a number of intellectual outputs including publications in local and international peer-reviewed journals detailing the results of the various phases and components of the study. It is expected that the results will lend considerable insights into the way large-scale applications of PA programmes in Malta are conceptualised.

RESULTS

The results indicate limited significant effects of a daily PA programme on academic, physical and life satisfaction outcomes. While one might expect improved performance of physical skills, and reduced performance in academic measures, neither effect was detected. The evidence shows that the implementation of a daily PA programme, therefore, had no adverse effects on academic performance. According to five days of pedometry data, the study also showed that there was a significant difference in the number of steps taken during school hours due to the treatment. Furthermore, this effect was sufficient to differentiate, Maltese schools without a daily PA programme as examples of bad practice by known international standards, and conversely, Maltese schools with a daily PA programme as examples of best practice by international standards reported in the literature. It was also highlighted that dimensions orbiting the daily PA programme were crucial to its enactment and need to be taken into consideration. These four dimensions are, the existing local educational policies and their alignment to the programme, the school dynamics present within the different settings, the educational logistical considerations, taken by the school as well as other stakeholders, to make sure that the project could be executed in a good manner and, the engagement and sense of belonging experienced by the various stakeholders.

IMPACT OF RESEARCH

The results raise questions about the measurable impact of daily PA within the space of a single scholastic year, and in the context of the child's developmental stages. Children might be variably sensitive to the effects of PA in different age cohorts. Questions can also be raised about the impact of a daily PA programme not only during school hours but across the entire day. In cases where children fail to meet daily PA requirements, more research is needed to ascertain if the amount of activity due to daily PA in schools makes a significant difference on the national scale. Furthermore, the results encourage consideration of alternative modalities



of PA organisation and provision, not necessarily limited to structured PA sessions, sports sessions, or PE lessons. Sports and PA initiatives may benefit from re-imagining a more organic integration of PA interspersed more seamlessly throughout the daily routines of Maltese children, both during and outside school hours. Ultimately, policymakers are encouraged to reflect on the precise aims and objectives increased PA via formal large-scale programmes are intended to serve.

KEYWORDS

Maltese education, physical activity, primary education, sports education, mixed-methods research

Interactions between bottlenose dolphins and small-scale fisheries in Malta

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BACKGROUND

Dolphins use their home range for all aspects of their ecology, including their main activities, foraging and feeding, as well as socialising, resting, and the protection and rearing of young. At the same time, many types of vessels use the dolphins' habitat, high and low-speed recreational vessels, commercial shipping, passenger ferries, and dolphin sightseeing tours. Their use of the habitat is increasing, as is their interactions with dolphins such that, in 2020, Terribile et al. claimed that "cetaceans have been appearing in Maltese waters for a number of years and fishers remark that interactions with cetaceans are constantly increasing" (Terribile et al., 2020). In 2021, the Environment and Resources Authority (ERA) of Malta confirmed that there is "a strong presence of dolphins and whales in Maltese waters" (ERA, 2021). The research, which forms part of Malta's Assessment of Marine Waters is consolidated by the study by Laspina et al. (2022) which found that "dolphin presence has increased in the past five years", particularly in the vicinity of bluefin tuna, seabream, and seabass fish farm locations.

*Considering this confirmed strong presence and their known interaction with small-scale fisheries, this study investigates the interaction between trammel net fisheries and bottlenose dolphins (*Tursiops truncatus*) around the Mediterranean Maltese Islands. This study provides a baseline against which to compare cetacean-fisheries activities, giving insights on trammel net fisheries and suggesting improvements that are sustainable both in terms of cetacean populations but also in terms of the fishery itself. Previous results show that pingers are proving to be effective mitigation measures, albeit in the short term. This is because acoustic deterrent devices may result in a decrease in marine mammal responsiveness to the deterrent device over a period of time, due to habituation (Terribile and Laspina, 2023, Coram et al., 2014).*

OVERALL AIM

*To investigate the interaction between trammel net fisheries and bottlenose dolphins (*Tursiops truncatus*) around the Mediterranean Maltese Islands.*

MAIN EXPECTED OUTCOME/S

Firstly it is expected that depredation would be higher in close proximity to fish farms. It is also expected that dolphin depredation would be higher with a particular type of fishery, such as trammel net fisheries. Thirdly, it is expected that mitigation technologies be beneficial, though their extent and duration is still being analysed.

RESULTS

Pingers were tested with the aim of reducing the damaging depredation interactions on fishing activities.

The general results show that whereas 56.3% of net depredation was recorded when no pingers were used, this decreased to 29.4% when DDD 03x pingers were used, and depredation decreased further to 18.2% when DiD 01 pingers were used. It is clear that both pingers seem to be working, with better results achieved with the DiD01.

Results show that cetacean depredation is a commonly occurring phenomenon in Maltese waters, and even though the results achieved can be considered to be preliminary, it is clear that these pingers are proving to be effective mitigation measures, at least in the short-term.

IMPACT OF RESEARCH

This research is important since it involves collaboration with regional partners in order to be able to share lessons and understand the cetacean depredation and mitigation phenomenon more holistically. In fact, this project was supported by the MAVA Foundation and coordinated by the ACCOBAMS Secretariat, the General Fisheries Commission of the Mediterranean (GFCM) Secretariat, the Regional Activity Center for Specially Protected Areas of the Barcelona Convention (UNEP/MAP - SPA/RAC) and the Low Impact Fishers of Europe Platform (LIFE). All these entities supported research and conservation activities in five countries, including in Malta. As a result, MCAST and DFA researchers were invited to share their results at international conferences, including during the 'Mitigating dolphin depredation in Mediterranean fisheries: joining efforts for strengthening cetacean conservation and sustainable fisheries' event that was held in Catania (Italy) in June 2022, at the 'International Bycatch Meeting' that was held in Malaga (Spain) in October 2022 and at the 'Eighth meeting of the parties to ACCOBAMS' that was held in Malta in November 2022.

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KEYWORDS

cetaceans, small-scale fisheries, Tursiops truncatus, depredation

This project was supported by the MAVA Foundation and coordinated by the ACCOBAMS Secretariat, the General Fisheries Commission of the Mediterranean (GFCM) Secretariat,



the Regional Activity Center for Specially Protected Areas of the Barcelona Convention (UNEP/MAP - SPA/RAC) and the Low Impact Fishers of Europe Platform (LIFE)

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