

4 Creating a prototype for a seawater farm through an American-Tunisian virtual exchange

Nadia Cheikhrouhou¹ and Kenneth Ludwig²

Abstract

This paper will discuss a Virtual Exchange (VE) between the University of Michigan (USA) and the High Institute of Technological Studies of Béja (Tunisia) that took place between October and December 2019. Students from Tunisia and USA were enrolled in two entrepreneurship courses in their respective universities and joined together to work in groups on an innovative project on ‘creating a prototype for a seawater farm in the region of Khniss’ to be presented at the end of the semester. As this project was student-centered, the main focus was to show its impact on the students through their testimonials on what challenges they encountered and what benefits they gained from this experience at an academic and personal level. These testimonials showed that despite differences in intercultural communication competencies between American and Tunisian students and the use of English as a lingua franca, students gained valuable skills in team communication, collaboration, and coordination in a large team spread over two continents. Students taught each other and learned from each other while working toward solving a social and environmental problem the world is struggling with. Another light was shed on the impact of this VE on the instructors, the pedagogy adopted to conduct the project, as well as the contribution of the instructional support staff.

1. High Institute of Technological Studies of Béja, Béja, Tunisia; nadiachikhrouhou@yahoo.com; <https://orcid.org/0000-0003-4849-3134>

2. University of Michigan, Ann Arbor, USA; ken.ludwig@gmail.com; <https://orcid.org/0000-0003-3186-3645>

How to cite: Cheikhrouhou, N., & Ludwig, K. (2021). Creating a prototype for a seawater farm through an American-Tunisian virtual exchange. In M. Satar (Ed.), *Virtual exchange: towards digital equity in internationalisation* (pp. 51-60). Research-publishing.net. <https://doi.org/10.14705/rpnet.2021.53.1289>

Moving from a directive to a student-driven approach was rewarding for the Tunisian instructor who learned how to push students out of their comfort zone, dive into uncertain areas, and ask questions rather than accepting the norms. On his part the American instructor learned that it is possible to create meaningful, unconventional student-led projects across languages, cultures, and geography as long as the teams (students and faculty) are excited and committed to the project. He also learned that students get inspired to be brave, thoughtful, and resourceful when they can witness what effective professional collaboration by faculty looks like.

Keywords: seawater farm, problem-based learning, virtual collaboration.

1. Introduction

Water scarcity is a huge challenge in Tunisia. In fact, due to its arid to semi-arid climate, “Tunisia [is] facing increasingly [...] serious water shortage problems, [it is therefore important] to develop additional water resources as well as to preserve the existing ones” (Bahri, 2002, p. 2). Moreover, climate change is likely to place further pressure on water resources (Obeng, Bahri, & Grobik, 2015). This challenging situation was at the heart of a VE between students from the USA and Tunisia who worked on developing a prototype for a seawater farm instead of tackling the water scarcity problem. Students were split into five teams, each focusing on a different aspect on developing a successful seawater farm: legal, social, and cultural aspect, engineering aspect, environmental aspect, financial aspect, and finally marketing and communication aspect. Students were encouraged in this project to find an inexpensive solution based on existing scarce resources and the prototype was a farming sustainable system plan that exploited natural local resources in the region of Khniss in Tunisia. The instructional method adopted was a problem-based learning approach based on four current insights into learning: constructive, self-directed, collaborative, and contextual (Dolmans, De Grave, Wolfhagen, & Van Der Vleuten, 2005). This

approach frames a space “for students to learn to [be] active agents, creators of change during their university studies and [...] continue to be habitual agents and creators when they leave university to live and work in an uncertain, [complex] world” (Kek & Huijser, 2015, p. 410). Through this approach students are more likely to develop the right “skills to take risks, to reason critically, to reflect, to be resourceful, and to be autonomous – qualities of lifelong learners – which will allow them to work and live productively in a world of uncertainties” (Kek & Huijser, 2015, p. 408).

The aim of the current paper is to report on this VE: its context, its results and challenges, its impact on students, and finally the role of the instructors and the instructional support staff.

2. The context of the VE

This VE was conducted between October and December 2019 between the High Institute of Technological Studies of Béja and the University of Michigan. Thirty-five students participated in this VE, 25 from Michigan enrolled in ALA 256: The Innovator’s Toolkit course and ten from Béja enrolled in the Entrepreneurship course. Students were asked to create a blueprint for a sea water farm that would be built in a real-world location, in this case, Khniss, Tunisia.

Khniss is a small city located on the eastern coast of Tunisia. It features a marine depression with two levels in the sea; the first level is a confined lagoon with no significant marine waves or currents called by the locals the ‘Dead Sea’, and a second level with moderate waves and currents called the ‘Live Sea’. The lagoon used to have a particularly rich marine biodiversity which has been endangered in the last few decades by pollution due to urban and industrial waste. In addition, the water shortage is becoming an increasing problem especially during the dry season because water resources are diverted to the tourism sector.

To create a blueprint for a seawater farm in Khniss, students were split into five teams. Each team had its own goal (Table 1).

Table 1. Goals of the different teams

Team	Goal
Agriculture and environment	Use the salty Mediterranean water to farm crops that could feed a community of 5,000 people in a sustainable way with little to no negative environmental side effects
Engineering	Create infrastructure that produces food, water, and energy for 5,000 people
Finance	Make the project financially feasible and sustainable
Law, location, culture	Make sure that the project respects the laws and the culture of the area
Marketing communication and strategy	Promote the project to the world

Each team was composed of five American and two Tunisian students from different disciplines (computer sciences, mechanical engineering, psychology etc.) and from different levels of studies. This multidisciplinary helped enrich the exchange of ideas and co-construction of knowledge (McLean, 2009).

To achieve their goals, teams made a lot of research and talked to experts in the field from both countries. In addition, four students from Béja traveled to Khniss and interviewed locals to understand their needs and their problems, and to collect their opinions and suggestions about the project.

The outcome was a seawater farm plan that is inexpensive, eco-friendly with a low carbon footprint, and sustainable using local natural resources and respecting local diet and culture. First seawater is channeled from the sea to fish farms, then the water from these farms is channeled into farms that grow Salicornia and Mangroves which are trees that can remove salt from the water and make it suitable for human consumption and agricultural use. Students worked synchronously via WhatsApp and Messenger and asynchronously on Google Docs. Each team also created a YouTube video and a website³, for the whole project was created using Wix to share its outcomes with the world.

3. <https://rgmartin25.wixsite.com/seawaterfarm/what-we-do>

Students from Béja and Michigan presented their final project together virtually using the Blue Jeans videoconferencing tool. All the technical aspects of this videoconference were managed by the instructional support staff of the University of Michigan. At the end of the VE, students were also asked to reflect on their experience.

3. Results and challenges

Students from both Béja and Michigan made written reflections at the end of the project on their telecollaboration using the ‘What? So What? Now What?’ reflective model (Rolfé, Freshwater, & Jasper, 2001). Below are some of the testimonies of participants’ experiences of their telecollaboration with colleagues from the other institution, in another country.

One participant from the University of Michigan highlighted the friendship formed and the cultural exchange that occurred:

“this experience was great because it allowed me to work with others around the world and learn from them things that I would otherwise not have learned. It has also allowed me to learn more about another country and its culture which is very important to better help reduce the discrimination in the world. Last but not least I made a friend all the way across the world”.

Another participant from the USA talked about the importance of multidisciplinary in the team:

“I personally believe that our team’s connection with [Name of a student from Tunisia] was the most important part of our project. I learned that we should be willing to learn from one another, especially because our peers have expertise in various areas, and we can learn a lot from their experiences and knowledge set. As a current student of physical therapy, I now focus my studying methods on learning from my

classmates. Especially during COVID-times, Zoom study groups have been an extremely useful study tool for me. It truly amazes me how another person's perspective can show you various paths in approaching a problem".

So this VE helped students to explore new perspectives and see the world from a different lens. They discovered new cultures and new ways of collaboration across geography. They felt like they were complementing each other to achieve a noble cause. One participant from Tunisia added:

“on the 10th of November 2019 I found myself on a road trip to discover my own country going to Khniss for the first time ever, I didn't even know that this place existed before the project”.

By interviewing locals in Khniss, students developed their empathy skills. By trying to understand and solve the water issue in the region of Khniss, students enhanced their community engagement and global citizenship competencies. Talking about challenges in online collaboration one participant from the University of Michigan commented:

“as you might imagine, keeping everyone on the same page was challenging, and we had to adapt quickly in order to ensure everyone remained on the same page. We did this through regularly communicating with the other teams”.

As mentioned in the last testimonial, communication within the groups was sometimes challenging due mainly to the difference in intercultural communicative competence between American and Tunisian students on the one hand and the use of English as the language of instruction on the other hand. As a matter of fact, compared to Tunisian students, American peers live in a more culturally diverse society. This could probably create an imbalance in terms of intercultural communicative competence in favor of American students who were more flexible than their Tunisian counterparts who additionally have no mobility opportunities and had no previous international experience.

Moreover there were also some issues related to the language of the exchange, i.e. English as a lingua franca. In Tunisia, English as a foreign language negatively impacted some students' ability to communicate with their American partners who dominated the group. That is why in each group the Tunisian instructor made sure that there is at least one Tunisian student who is fluent in English to communicate directly with American peers.

4. The role of the instructors

Before the VE, both instructors had different pedagogical approaches. Indeed, the American instructor was creating a much more ambiguous and complex environment of learning for his students than the Tunisian one by providing little guidance for a complex project.

As one of the American students stated:

“at first, when we were introduced to this project, I was very confused. No one knew what a seawater farm was and there is little on the internet explaining this concept. All we had to go off of was a quick doodle our instructor drew in an attempt to make the vision more clear. However this did not help. One thing that did however help was when our instructor told us that ‘now is not the time to have answers just try to ask as many questions as possible’, this allowed me to take the pressure off of myself and realize that I can work at my own pace as long as I accomplish what I need to get done. This allowed me to quickly adjust and strive during the project”.

And since entrepreneurs act in a VUCA (Volatile, Uncertain, Complex, and Ambiguous) world, or what Barnett calls the age of supercomplexity “in which there are no stable descriptions of the world, no concepts that can be seized upon with any assuredness, and no value systems that can claim one’s allegiance with any unrivaled authority” (Barnett, 2004, p. 252), it is important to simulate this environment for students in the entrepreneurship class.

So, the role of the instructors was not to lecture but to listen very attentively to what students were saying and the learning that was taking place in the team, and to ask questions that encouraged critical thinking and encouraging students to be responsible to complete high quality independent learning (Barrett & Cashman, 2010, p. 11). In this VE, instructors decided that it was better to say less – or even nothing – and to provide students with minimal guidance so they could feel that they were taking the lead in the learning by asking the right questions and researching for possible answers. This was new for the Tunisian instructor – who before this VE had adopted a more directive pedagogy – which brought her out of her safe zone but she was eager to challenge herself and learn new things. What she learned from her American partner was to push students to be uncomfortable – most students had never even heard of a seawater farm before – dive into uncertain areas, and ask questions rather than accept the standards. This was challenging at first for the Tunisian students who were used to strict rules and regulations set in place by their professors but the collaborative work they had with their American partners helped them take ownership over their learning: they were doing research, talking about their findings, teaching each other, and learning from each other.

The American instructor learned that it is possible to create unconventional student led projects across languages, cultures, and geography. He believed that bold vision gets further pedagogically and leads to greater impact than tightly scripted and controlled faculty driven efforts and that trusted colleagues provide the bridges over the chasms that may appear.

Another question discussed between the instructors was whether to have groups competing against each other or collaborating. The collaborative option was preferred with interrelated groups and the success of the whole project depending on the efforts and the commitment of each group. This added on one hand more complexity to the problem to be solved and on the other hand allowed for the opportunity for each group to reflect on its contribution and how much this contribution was important for the other groups and for the success of the whole project.

Also, it is important to mention that the participation of the instructional support staff of the University of Michigan was very important for the success of this project since they were constantly communicating with both the instructors and the students to provide help when necessary and coordinating the whole process. They ensured all the logistical parts of the VE, like organizing different Zoom meetings with the two instructors to monitor the project. They also organized the videoconference for the final presentations of the different teams and tested in that regard the Blue Jeans tool with the students from Béja. They were seen by all as full, essential, and equal partners in the project.

5. Conclusion

This VE aimed to contribute to the development of “key transferable skills for work and social life of the students: Critical thinking skills, Problem solving skills, Research skills, Creative thinking skills, Communication skills, Teamwork skills [and] Information literacy skills” (Barrett & Cashman, 2010, p. 10). It showed that it is possible to create meaningful student led projects across languages, culture, and geography. Students realized a seawater farm plan that is cost effective and sustainable using natural local resources and respecting the natural ecosystem in the region of Khniss. This required them to be empathetic, creative, and flexible to adapt to the local context of Khniss which are key competencies for entrepreneurs.

Both instructors learned from each other as well and felt growing at a personal and professional level through this VE. Their role was mainly to make sure that the learning environment allows students to deal with uncertainty in productive and creative ways. They saw their function to be facilitators of the whole process by monitoring if necessary, improving the quality of the discussion in the group, and allocating the responsibility of learning on learners. They also had the responsibility to ensure a collaborative learning environment where students share common goals, and are dependent on and accountable to each other.

Finally we can add that in the interconnected world we are living in it is important that students think across borders to solve global issues.

6. Acknowledgments

The authors are grateful to Philomena Meechan and Todd Austin, the instructional support staff of the University of Michigan, Allison Westra and Isabella Przybylska, teaching assistants at the University of Michigan, and the students: Lorenzo Harris, Iheb Merai, Bahaeddine Chouchène, and Rahee Patel.

References

- Bahri, A. (2002). Water reuse in Tunisia: state and prospective. *Actes de l'atelier du PCSI, Montpellier, France, 28-29 May 2002*.
- Barnett, R. (2004). Learning in an unknown future. *Higher Education Research and Development, 23*(3), 247-260. <https://doi.org/10.1080/0729436042000235382>
- Barrett, T., & Cashman, D. (2010). (Eds). *A practitioner's guide to enquiry and problem-based learning: case studies from University College Dublin*. UCD Teaching and Learning. <https://dokumen.tips/documents/constructivism-problem-based-learning.html>
- Dolmans, D. H., De Grave, W., Wolfhagen, I. H., & Van Der Vleuten, C. P. (2005). Problem-based learning: future challenges for educational practice and research. *Med Educ, 39*(7), 732-741. <https://doi.org/10.1111/j.1365-2929.2005.02205.x>
- Kek, M., & Huijser, H. (2015). 21st century skills: problem-based learning and the University of the Future. *Proceedings of the Third 21st Century Academic Forum Conference, Harvard, Boston, USA, 20-22 September 2015*.
- McLean, M. (2009). Critical mass. In P. Ramsden (Ed.), *Teachers as learners – the development of academic staff* (pp. 24-26). HEA: Academy Exchange.
- Obeng, A., Bahri, A., & Grobik, A. (2015). Water scarcity and global megacities. In J. Osikena & D. Tickner (Eds), *Tackling the world water crisis: reshaping the future of foreign policy*. Policy Center.
- Rolfé, G., Freshwater, D., & Jasper, M. (2001). *Critical reflection in nursing and the helping professions: a user's guide*. Palgrave Macmillan.



Published by Research-publishing.net, a not-for-profit association
Contact: info@research-publishing.net

© 2021 by Editor (collective work)
© 2021 by Authors (individual work)

Virtual exchange: towards digital equity in internationalisation
Edited by Müge Satar

Publication date: 2021/08/16

Rights: the whole volume is published under the Attribution-NonCommercial-NoDerivatives International (CC BY-NC-ND) licence. Under the CC BY-NC-ND licence, the volume is freely available online (<https://doi.org/10.14705/rpnet.2021.53.9782490057955>) for anybody to read, download, copy, and redistribute provided that the author(s), editorial team, and publisher are properly cited. Commercial use and derivative works are, however, not permitted.

Disclaimer: Research-publishing.net does not take any responsibility for the content of the pages written by the authors of this book. The authors have recognised that the work described was not published before, or that it was not under consideration for publication elsewhere. While the information in this book is believed to be true and accurate on the date of its going to press, neither the editorial team nor the publisher can accept any legal responsibility for any errors or omissions. The publisher makes no warranty, expressed or implied, with respect to the material contained herein. While Research-publishing.net is committed to publishing works of integrity, the words are the authors' alone.

Trademark notice: product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Copyrighted material: every effort has been made by the editorial team to trace copyright holders and to obtain their permission for the use of copyrighted material in this book. In the event of errors or omissions, please notify the publisher of any corrections that will need to be incorporated in future editions of this book.

Typeset by Research-publishing.net
Cover illustration by © [ryzhi - stock.adobe.com](https://ryzhi-stock.adobe.com)
Cover layout by © 2021 Raphaël Savina (raphael@savina.net)

ISBN13: 978-2-490057-95-5 (Ebook, PDF, colour)
ISBN13: 978-2-490057-96-2 (Ebook, EPUB, colour)
ISBN13: 978-2-490057-94-8 (Paperback - Print on demand, black and white)
Print on demand technology is a high-quality, innovative and ecological printing method; with which the book is never 'out of stock' or 'out of print'.

British Library Cataloguing-in-Publication Data.
A cataloguing record for this book is available from the British Library.

Legal deposit, France: Bibliothèque Nationale de France - Dépôt légal: août 2021.
