TANGIBLES AND TRANSVERSAL SKILLS TO INTEGRATE SUSTAINABILITY IN TEACHING

Dr. Natascia Petringa, Dr. Ingrid Le Duc

École Polytechnique Fédérale de Lausanne (EPFL), Teaching Support Centre (CAPE)

OVERVIEW OF WORKSHOP

This workshop is designed for university teachers, teaching assistants or leadership members working in technical universities. This highly interactive workshop uses tangible activities and allows participants to collaborate in teams with the aim of integrating sustainability whilst having a lens on transversal skills development.

The workshop aims to validate the reviewed version of an evidence-based template for presenting and explaining scientific concepts called LOAFS (Tormey et al., 2021). Our adaptation of the LOAFS template adds a collective reflection of team outputs.

KEYWORDS

Sustainability, evidence-based teaching, tangibles, transversal skills, Standards: 4, 8, 9, 11.

DURATION

The length of the workshop is 120 minutes.

ACTIVITIES

The workshop is structured in six steps and involves: 1.) an opening, to activate prior knowledge on sustainability; 2.) a focus on the affordances of working with tangibles; 3.) two experiential and cooperative learning activities using LEGO® to work in teams on a "nightmare sustainability" scenario; 4.) group feedback in the form of a Gallery Walk; 5.) a consolidation of learning, in this case, using a checklist of transversal skills underpinned within the activity; and finally, 6.) engaging the participants in a plenary discussion about the activities, transversal skills development, and the need to integrate sustainability. To strengthen the plenary discussion, a collective reflection phase has been added to the existent template. We aim to test its relevance in this workshop.

The underlining question driving this workshop is whether the revised LOAFS template and the manipulation of objects used to create a nightmare sustainability scenario stimulate participants' critical thinking. We hypothesize that the workshop has the potential to identify where the intersection of current issues such as sustainability, transversal skills, and

tangibles are juxtaposed. A secondary question relates to the applicability and utility of a list of transversal skills for technical universities in different domains (or subjects).

TARGET AUDIENCE

The workshop is designed for university teachers, teaching assistants or members in leadership roles working in technical universities who are currently exploring the intersection of sustainability and transversal skills development in their university courses. It also targets an audience interested in experiential learning using tangibles. No background knowledge is required for the participants, nor is any pre-workshop preparation needed.

OUTCOMES

At the end of this workshop, participants shall be able to:

a) Apply the new proposed LOA-AFS template to identify students' transversal skills in different learning scenarios.
b) Create a concrete and consensual representation of a nightmare scenario for sustainability in their area of teaching.
c) Share the benefits (affordances) and drawbacks of using representations.
d) Validate the sequential process of working with tangibles (ideation-modelling-receiving feedback-remodeling-reflection).
e) Identify the transversal skills used during the hands-on activities in the workshop and match these to a checklist.

SPECIAL REQUIREMENTS

This is a tangible-based workshop which requires physical presence. Online attendance will rely on observation.

The workshop requires a specific room set-up with tables in islands for small group work, large white poster paper (A2 format) and different colored markers. We will bring the necessary material for working with the tangibles.

REFERENCES

Azapagic, A., Perdan, S., & Shallcross, D. (2005). How much do engineering students know about sustainable development? The findings of an international survey and possible implications for the engineering curriculum. *European Journal of Engineering Education*, *30*(1), 1-19.

Boyle, C. (2004). Considerations on educating engineers in sustainability. *International Journal of Sustainability in Higher Education*, *5*(2), 147-155.

Murphy, C. F., Allen, D., Allenby, B., Crittenden, J., Davidson, C. I., Hendrickson, C., & Matthews, H. S. (2009). Sustainability in engineering education and research at US universities. *Environmental Science & Technology*, *43*(15), 5558–5564.

Peña Miguel, N., Corral Lage, J., & Mata Galindez, A. (2020). Assessment of the development of professional skills in university students: Sustainability and serious games. *Sustainability*, *12*(3), 1014.

Quelhas, O. L. G., Lima, G. B. A., Ludolf, N. V. E., Meiriño, M. J., Abreu, C., Anholon, R., ... & Rodrigues, L. S. G. (2019). Engineering education and the development of competencies for sustainability. *International Journal of Sustainability in Higher Education*, *20*(4), 614-629.

Rampasso, I. S., Anholon, R., Silva, D., Ordoñez, R. C., Santa-Eulalia, L. A., Quelhas, O. L. G., ... & Aguirre, L. G. (2019). Analysis of the perception of engineering students regarding sustainability. *Journal of Cleaner Production*, *233*, 461-467.
Sánchez-Carracedo, F., Segalas, J., Bueno, G., Busquets, P., Climent, J., Galofré, V. G., ... & Vidal, E. (2021). Tools for Embedding and Assessing Sustainable Development Goals in Engineering Education. *Sustainability*, *13*(21), 12154.
Segalàs, J., Ferrer-Balas, D., & Mulder, K. F. (2010). What do engineering students learn in sustainability courses? The effect of the pedagogical approach. *Journal of Cleaner Production*, *18*(3), 275-284.
Tang, K. H. D. (2018). Correlation between sustainability education and engineering students' attitudes towards sustainability. *International Journal of Sustainability in Higher Education*, *19*(3), 459-472.
Thürer, M., Tomašević, I., Stevenson, M., Qu, T., & Huisingh, D. (2018). A systematic review of the literature on integrating sustainability into engineering curricula. *Journal of Cleaner Production*, *181*, 608-617.
Tormey, R., Isaac, S., Hardebolle, C., & Le Duc, I. (2021). *Facilitating Experiential Learning in Higher Education: Teaching and Supervising in Labs, Fieldwork, Studios, and Projects*. Routledge.

BIOGRAPHICAL INFORMATION

Natascia Petringa: PhD is a Pedagogical Advisor at the *École Polytechnique Fédérale de Lausanne* (EPFL), Teaching Support Centre (CAPE). She is currently working on a funded-project called 3T PLAY which explores the use of tangibles in technical universities to develop transversal skills. She works with professors, teaching assistants, and university students at all levels (BA, MA and PhD).

Ingrid Le Duc: PhD is an educational consultant, teacher and trainer with over 15 years of experience. Currently a Pedagogical Advisor at the *École Polytechnique Fédérale de Lausanne* (EPFL), Teaching Support Centre (CAPE) and a Lecturer at the University of Bern in Switzerland. She takes on the leadership of projects on teaching and learning in STEM disciplines; and is passionate about the intersection of theories of learning and the realities lived by teachers and researchers.

Corresponding author

Natascia Petringa
EPFL AVP-E CAPE
RLC D1 740 (Rolex Learning Center)
Station 20
CH-1015 Lausanne, SWITZERLAND
natascia.petringa@epfl.ch