ICT-INOV
MODERNIZING ICT EDUCATION FOR HARVESTING INNOVATION

D4.6 Good practice guidelines

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Document Info	
Project reference	**618768/2020**
Deliverable	D4.6 Good practice guidelines
Dissemination level	Public
Date	14/3/2024
Document version	1.0
Status	FINAL
Sharing	CC-BY-NC-ND
Authors	Hariklia Tsalapatas, University of Thessaly Olivier Heidmann, University of Thessaly Christina Taka, University of Thessaly
Reviewers	Hariklia Tsalapatas, University of Thessaly
Approved by	Steering Committee

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Contributors

Carlos Vaz de Carvalho, Porto Polytechnic

Paula Escudeiro, Porto Polytechnic

Raja Jamilah Raja Yusof, University of Malaya

Azah Anir Norman, University of Malaya

Saaidal Razalli Azzuhri, University of Malaya

Hazleen Aris, Universiti Tenaga Nasional

Zailani Ibrahim, Universiti Tenaga National

Husni Mohd Radzi, Universiti Tenaga National

Irum Inayat, National University of Future and Emerging Sciences

Kamran Khowaja, ISRA University

Huy Nguyen, Von Neumann Institute

Minh Tran, John von Neumann Institute

Nguyet Dinh Thi Minh, Hanoi University

Thang Xuan Nguyen, Hanoi University

Tri Ratna Bajracharya, Tribhuvan University

Shree Raj Shakya, Tribhuvan University

Aman Shakya, Tribhuvan University

Dhiraj Shrestha, Kathmandu University

Manish Mokharel, Kathmandu University

Raja Jamilah Raja Yusof, University of Malaya

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Azah Anir Norman, University of Malaya

Saaidal Razalli Azzuhri, University of Malaya

Adeleh Asemi Zavareh, University of Malaya

Nazean Jomhari, University of Malaya

Siti Hafizah Ab Hamid, University of Malaya

Triinu Jesmin, Tallinn University

Jaanus Terasmaa, Tallinn University

Alden Meirzhanovich Dochshanov, EU-TRACK

Michela Tramonti, EU-TRACK

Fabrizio Casadio, EU-TRACK

Libera Pezzano, EU-TRACK

Konstantina Vlachoutsou, University of Thessaly

Dimitris Ziogas, University of Thessaly

Menelaos Kokaras, University of Thessaly

Konstantinos Katsimentes, University of Thessaly

Sotiris Evaggelou, University of Thessaly

Alexandros Prigkos, University of Thessaly

Apostolos Lampis, University of Thessaly

Kostantinos Mitrakopoulos, University of Thessaly

Emmanouil Anagnostakis, University of Thessaly

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Content

Executive Summary **13**

Preparation **14**

Scaffold instructor competencies on applying design thinking **15**

Why is this a good practice? **15**

Challenge **15**

Solution **15**

Authors **15**

Build student teams with diverse competencies. **16**

Why is this a good practice? **16**

Challenge **16**

Solution **16**

Authors **16**

Create a toolset of activities for each step of the design processes **17**

Why is this a good practice? **17**

Challenge **17**

Solution **17**

Authors **17**

Design the student workspace **18**

Why is this a good practice? **18**

Challenge **18**

Solution **18**

Authors **19**

Foster a supportive collaboration environment **20**

Why is this a good practice? **20**

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Challenge 20
Solution 20
Authors 20
Support the institutionalisation of design thinking implementation 21
Why is this a good practice? 21
Challenge 21
Solution 21
Authors 21
Develop a framework or ecosystem for the sustainability of the implementation of design thinking. 22
Why is this a good practice? 22
Challenge 22
Solution 22
Authors 22
Empower students through practical ICT learning by unveiling gamified design thinking. 23
Why is this a good practice? 23
Challenges 23
Solution 24
Authors 24
Content design 27
Select a problem that is linked to real-life experiences 28
Why is this a good practice? 28
Challenge 28
Solution 28
Authors 29
Create an activity that challenges students through time pressure 30

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Why is this a good practice? 30
Challenge 30
Solution 30
Authors 30
Incorporate sustainable development goals in your teaching 31
Why is this a good practice? 31
Challenge 31
Solution 31
Authors 31
Introduce activities on redesigning processes for reducing emissions 32
Why is this a good practice? 32
Challenge 32
Solution 32
Authors 32
Encourage students to design for others, not themselves 33
Why is this a good practice? 33
Challenge 33
Solution 33
Authors 34
Consider ethical implications and responsibilities in design 35
Why is this a good practice? 35
Challenge 35
Solution 35
Authors 35
Incorporate agile methods in design thinking. 36
Why is this a good practice? 36

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Challenge 36
Solution 36
Authors 36
Embody design through real practice: the case of Design Project for Orphans. 37
Why is this a good practice? 37
Challenge 37
Solution 37
Authors 38
Encourage students to develop project management skills 39
Why is this a good practice? 39
Challenge 39
Solution 39
Deployment 40
Build student teams in an effective way 41
Why is this a good practice? 41
Challenge 41
Solution 41
Authors 41
Build diverse and cross-functional teams. 42
Why is this a good practice? 42
Challenge 42
Solution 42
Authors 43
Focus on specific design thinking steps in specific ICT courses for different types of learning strategies. 44
Why is this a good practice? 44

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Challenge 44
Solution 44
Authors 44
Create an activity that challenges students through time pressure 45
Why is this a good practice? 45
Challenge 45
Solution 45
Authors 45
Engage students in curriculum syllabus design. 46
Why is this a good practice? 46
Challenge 46
Solution 46
Authors 46
Reward students upon completion of each assigned task 47
Why is this a good practice? 47
Challenge 47
Solution 47
Authors 47
Provide immediate feedback upon completion of each assigned task 48
Why is this a good practice? 48
Challenge 48
Solution 48
Authors 48
Empathise before you ideate 49
Why is this a good practice? 49
Challenge 49

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Solution 49
Authors 50
Prototype frequently and iteratively 51
Why is this a good practice? 51
Challenge 51
Solution 51
Authors 52
Test prototypes with actual users 53
Why is this a good practice? 53
Challenge 53
Solution 53
Authors 53
Increase student focus through rewards and motivation 54
Why is this a good practice? 54
Challenge 54
Solution 54
Authors 55
Make team dynamics work well. 56
Why is this a good practice? 56
Challenge 56
Solution 56
Authors 56
Encourage students to refrain from introducing solutions early in the design thinking process. 57
Why is this a good practice? 57
Challenge 57

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Solution 57
Authors 57
Describe the problem in terms of pains, wants, and needs 58
Why is this a good practice? 58
Challenge 58
Solution 58
Authors 58
Validate the problem definition and its impact 59
Why is this a good practice? 59
Challenge 59
Solution 59
Authors 59
Generate an innovative startup idea by applying empathy 60
Why is this a good practice? 60
Challenge 60
Solution 60
Leverage visualisation tools 61
Why is this a good practice? 61
Challenge 61
Solution 61
Foster collaborative problem-solving with virtual design sprints 63
Why is this a good practice? 63
Challenge 63
Solution 63
Authors 63
Implement reflective learning journals. 64

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Why is this a good practice? **64**
Challenge **64**
Solution **64**
Authors **64**
Create a conducive environment during brainstorming. **65**
Why is this a good practice? **65**
Challenge **65**
Solution **65**
Conclusion **66**

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Executive Summary

ICT-INOV develops a gamified design thinking learning intervention for building innovation skills among Computer Science and Engineering higher education students. The project introduces a vertical implementation that addresses all aspects of fostering innovation in higher education through the establishment of physical innovation labs, the design and implementation of a digital learning platform that promotes gamified design thinking, the design of educational activities that students deploy online collaborating in groups, instructor training, and community building for building organisational capacity to promote innovation for the benefits of wider communities.

This document is a set of good practices that educators can apply to maximise the positive benefits of the ICT-INOV learning intervention for innovation. The good practices result from educator experiences in piloting activities within the ICT-INOV project in real-life educational contexts, where students and instructors deployed the developed physical and digital infrastructures and content in actual courses. The good practices integrate the collective knowledge gained by ICT-INOV project participants, which is shared to enrich higher education practices related to innovation.

The good practices are organised in 3 tangents, namely preparation, content design, and implementation, supporting educators throughout the adaptation and deployment of the proposed innovation-building learning design in their courses.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Preparation

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Scaffold instructor competencies on applying design thinking

Why is this a good practice?

This practice fosters the correct implementation of design thinking activities through a good understanding of design thinking practices among instructors who deploy innovation skill-building exercises in their courses.

Challenge

Some instructors need further support to integrate gamified design thinking into their courses despite participating in instructor training. If they are not fully prepared to deploy the ICT-INOV gamified design thinking learning intervention, they may not fully benefit from the added value of fundamental design thinking concepts for innovation.

Solution

Organise small support sessions on a regular basis to allow instructors to discuss, inquire about, and share teaching plans. Piloting experience at the University Tenaga National, Malaysia, has shown that instructors at the early steps of their familiarisation with design thinking can benefit from presenting their teaching plan for the upcoming semester to peers and receiving feedback and reinforcement. To maximise the benefits of this practice, the teaching plan that instructors present should provide details on how and where they are going to apply design thinking methods in their teaching, assignments, and assessments. This is an effective method for verifying the accurate translation of their theoretical understanding of design thinking to practical implementation.

Authors

Hazleen Aris, Zailani Ibrahim, and Husni Mohd Radzi, Universiti Tenaga National

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Build student teams with diverse competencies.

Why is this a good practice?

This practice helps students to build a balanced team incorporating different perspectives and capabilities.

Challenge

Usually, design thinking is applied to problems that are too complex and have multiple dimensions. Solving such problems, generally, requires thinking from different perspectives and considering various solutions. Further tasks like research, documentation, and building prototypes require different skills. Students generally work in tight circles with friends with similar skills. There is a challenge to breaking this barrier and encouraging them to collaborate with others and bring diverse capabilities into their group.

Solution

Prepare a template to describe the profile of each student. The profile template may include characteristics such as their previous educational background, age, gender, nationality, skill set, hobbies, personal character, and more. The students may be asked to build teams that include as many different types of attributes as possible from these profiles. Students may be encouraged to apply techniques described in design thinking training materials to develop their profile and form balanced teams. The instructor may even directly build up the teams by grouping individuals with diverse personalities and skills if students are reluctant to leave their comfort zones. At the very least, the instructor can assist students in building good teams. Finally, students can create a team identity or description reflecting the diverse personalities and competencies included.

Authors

Aman Shakya and Shree Raj Shakya, Tribhuvan University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Create a toolset of activities for each step of the design processes

Why is this a good practice?

Having a prepared toolset of activities for each step of the design process supports the design of meaningful innovation-building learning activities through combinations and adaptations of exercises for best-addressing participant needs and interests.

Challenge

The design of purposeful and powerful student learning experiences can be significantly enriched through meaningful activities for each step of the design process.

Solution

Review resources and create a toolset of exercises that can be integrated into each step of the design thinking process, such as team building, problem discovery, problem definition, ideation, prototyping, and evaluation. For example, team-building exercises can be organised to take place in small groups or engage the entire participant body. They can further be indoors or outdoors. Problem discovery exercises may include interviews, shadowing of users in their typical environment, researching expert information, and more. Prototype fidelity can range from abstract design to digital models. A full toolset of activities allows educators to carefully combine activities for building student innovation skills and competencies in diverse learning contexts and among diverse groups.

Authors

Hariklia Tsalapatas, Olivier Heidmann, Christina Taka, and Nadia Vlachoutsou, University of Thessaly

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Design the student workspace

Why is this a good practice?

Preparing a conductive workspace for participants in innovation design can positively impact focus, activities, engagement, involvement, and outcomes.

Challenge

Workspaces must be conductive of collaboration, sharing, and brainstorming in an inclusive and accessible way to foster innovation.

Solution

Consider how collaboration will take place among participants in innovation-building activities. Will participants be present in person? Will they participate from a distance? Will some be present while others connect virtually? Will collaboration take place over a short or longer period, for example, covering a few months? What devices will participants use to connect if they connect virtually? All of the above affect the interaction of participants.

Considering all parameters, design the participant workspace. The workspace can have a physical setting, such as a classroom with all participants physically present. It can have a fully digital setting, with participants connecting virtually using the ICT-INOV digital collaborative platform. It can be hybrid, with some participants participating in person while others virtually. It can be flexible, with some sessions taking place in a physical setting while others are virtually or in hybrid mode.

The workspace will affect the types of activities that participants will engage with. It will also affect the nature of collaboration.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The educator may need to adjust activities based on the workspace form. For example, consider team-building exercises. If they are implemented in person, they may involve physical movement and in-person interaction of participants in the classroom. They can only involve participant interaction through a digital medium when implemented virtually.

Authors

Hariklia Tsalapatas, Olivier Heidmann, Menelaos Kokaras, Kostas Katsimentes, and Dimitris Ziogas
University of Thessaly

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Foster a supportive collaboration environment

Why is this a good practice?

A supportive environment helps participants express ideas without the fear of criticism, allowing diverse viewpoints to be considered for a solution.

Challenge

Teamwork can be most effective when all participants engage and contribute to the common goal. Engagement can be encouraged through a supportive environment, a sense of affiliation, and belonging to a team and a class.

Solution

Class participants may not be familiar with each other. Team building activities can foster effective collaboration by breaking the ice and getting team and class members to know each other's professional and personal interests and aspirations. Team building activities can take place indoors or outdoors. They can be performed within a small group or by engaging the entire class. In addition, team-building activities can be used at intervals in long sessions to allow participants some rest and to bring energy back to a tired group. Team activities may range from outdoor competitions that can only be won through team collaboration to more static exercises that can take place indoors and encourage participants to get to know each other through games or questions.

Authors

Hariklia Tsalapatas, Olivier Heidmann, Christina Taka, Sotiris Evaggelou, and Nadia Vlachoutsou, University of Thessaly

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Support the institutionalisation of design thinking implementation

Why is this a good practice?

This practice enables a more structured and top-down approach to implementing design thinking in suitable ICT courses to reap organisational benefits.

Challenge

After piloting the proposed design thinking approach in courses voluntarily, it is important to work with organisational authorities towards promoting a wider and structured deployment of the solution in formal curricula courses to maximise impact.

Solution

The research team must work closely with the authorised department of the university, such as the teaching and learning centre or the Deputy Vice-Chancellor division in charge of academic affairs. Collaboration with organisational management will ensure a top-down approach to introducing innovation skill-building methodologies in organisational curricula, promoting wider use of practices for student and educator innovation capacity building.

Authors

Hazleen Aris, Zailani Ibrahim, and Husni Mohd Radzi, Universiti Tenaga National

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Develop a framework or ecosystem for the sustainability of the implementation of design thinking.

Why is this a good practice?

This practice ensures the sustainability of long-term approaches for building student and educator innovation capacity without dependence on the expertise of specific individuals.

Challenge

It is important to ensure the sustainability of gamified design thinking approaches in the long term, beyond project completion.

Solution

Develop and adopt a design thinking implementation framework that covers the complete lifecycle of design, deployment, and continuous improvement of innovation-building methodologies, which can be used as a reference. This will ensure that the implementation of gamified design thinking for innovation skill building will not be dependent on a person's or team's expertise but will be deployed as good practice through recommendations and guidelines in the long term. Below is an example of such a framework developed by the Universiti Tenaga Nasional team.

Authors

Hazleen Aris, Zailani Ibrahim, and Husni Mohd Radzi, Universiti Tenaga National

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Empower students through practical ICT learning by unveiling gamified design thinking.

Why is this a good practice?

Practical ICT learning through gamified design thinking is important due to its transformative impact on education. This approach moves beyond traditional learning, actively engaging students in problem-solving, collaboration, and creativity. Simulating real-world scenarios equips students with practical skills and the ability to innovate, aligning their education with the demands of modern industries. This method fosters critical thinking and adaptability, essential qualities in a rapidly evolving technological landscape, preparing students not just for exams but for future careers where innovation and creative problem-solving are valued. Additionally, it cultivates a sense of ownership and empowerment among students, making learning an immersive and enjoyable experience, ultimately enhancing their ability to contribute meaningfully to society.

Challenges

Accessibility challenges: some students might face barriers to accessing the ICT-INOV digital learning platform due to technological limitations or lack of resources.

Varying engagement levels: not all students may engage equally or find the gamified approach equally motivating or effective for their learning style.

Evaluation and assessment: assessing the effectiveness and impact of gamified design thinking on student learning outcomes could be challenging, requiring robust evaluation methods.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Solution

Provide resources such as devices, internet connectivity, or alternative access points for students with technological limitations.

Introduce diverse engagement strategies by incorporating various engagement techniques within the ICT-INOV digital learning platform to cater to different learning styles and preferences.

Introduce a comprehensive assessment framework that tracks academic performance and measures soft skills development and problem-solving abilities facilitated by the gamified design thinking methodologies. This could involve surveys, feedback mechanisms, and performance assessments.

By addressing these issues through such solutions, the ICT-INOV digital learning intervention can contribute to a more inclusive, engaging, and effective learning experience for all students involved.

Authors

Adeleh Asemi, University of Malaya

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Team building and review of individual team member contribution

Why is this a good practice?

Teams should be built in a manner that allows each team member a fairly good chance to contribute to the work. Team dynamics and balance in terms of knowledge of the subject matter allow each member to contribute to the work. The assignment of members to teams plays a vital role in student engagement. For this reason, instructors may need to intervene to form balanced teams. In addition, instructors may need to review teamwork during execution and provide feedback on team members' individual contributions so that all participants are motivated to contribute further and better to the work. More specifically:

- **Regarding the equivalent contribution of each member to teamwork**, instructors must be aware that students involved in each group may have different levels and rank according to their knowledge and understanding of the course. Deserving students may actively contribute to the work, but average and below-average students may need scaffolding from the instructor to understand the problem and equally contribute to the work.
- **In terms of scaffolding team members, if required during the work**, instructors may need to review the work of individual team members. This helps provide scaffolding for team members to be actively involved and contribute to the work during the work.

Challenge

Enriching team dynamics

Balancing teams in terms of knowledge of the subject matter is not a trivial task. Instructors may gain insight into student knowledge and level of engagement through a pre-activity evaluation.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Team dynamics should be such that no team includes only average and below-average students or only good/meritorious students.

Individual student monitoring

Formative assessment during student work helps instructors become aware of support or scaffolding students may need to complete a project. The monitoring and scrutiny of individual student contributions may be a tedious task for the instructor.

Solution

Balanced team building

Pursue information on students' capabilities in the subject matter through students' earlier performance and knowledge and information in the subject matter. This information can help instructors intervene so that the teams have a balanced mix of students.

Individual student monitoring

Scrutinise the participation and contribution of each member to become informed on the contribution of each member. Instructors can achieve this through the review of individual contributions. This information allows instructors to plan supporting or scaffolding activities for teams and team members to foster student engagement.

Authors

Prof. Dr. Manish Pokharel, Dhiraj Shrestha, and Sameer Tamrakar, Kathmandu University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Content design

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Select a problem that is linked to real-life experiences

Why is this a good practice?

This practice ensures student engagement in learning through activities they can relate to and identify with.

Challenge

Students are more motivated to work on a problem related to their interests and experiences in real life. Students are exposed to challenges faced by industry and society through the news, conversations with colleagues, scientific articles, and everyday experiences. These topics motivate students to apply the foundational knowledge they develop in their studies as well as their soft skills, including innovation capacity, for converting ideas into action or addressing pressing societal challenges.

Solution

When selecting an activity topic for design thinking, be in tune with emerging business trends or societal needs. To select a topic of interest, discuss it with stakeholders in your region, including municipalities, companies, societies, or the public, to identify areas of potential improvement of quality of life-related to your discipline. Then, structure an activity on a real-world problem. This approach will ensure that students will be exposed to actual challenges and that their solutions will directly benefit their communities. Students will be more eager to address a real-life challenge that they, their families, or their peers have experienced and will be in a better position to empathise with target users and evaluate their solutions. This method will further demonstrate the link between innovation, growth, and community well-being.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Authors

Hariklia Tsalapatas, Olivier Heidmann, Apostolos Lampis, Alexandros Prigkos, Konsantinos Mitrakopoulos, University of Thessaly

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Create an activity that challenges students through time pressure

Why is this a good practice?

Time pressure is a gamification element that increases the intrinsic difficulty of a learning activity. The introduction of time pressure in learning utilises design thinking in an innovative, different, and playful way while creating challenges that motivate students.

Challenge

Some games include mechanics related to time management; players must solve challenges in a scheduled manner. This mechanic is used, for instance, in escape rooms. This is a highly effective mechanic for most individuals that fosters the player's motivation. The ICT-INOV platform can be used synchronously so that the teacher releases time-stamped challenges that participating groups must release within a specific timeframe.

Solution

An educator has a lot of options for designing an interesting scenario by creating a set of challenges related to a societal problem close to the students' interests. The challenges should be related to the selected problem, encouraging students to research information, solve puzzles, and more. The higher the variation in selected challenges, the better.

Educators may further deploy a ranking of teams based on the time each group takes to solve a set of challenges. This mechanic introduces rewards in the form of recognition, motivating student engagement in learning.

Authors

Carlos Vaz de Carvalho and Paula Escudeiro, Porto Polytechnic

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Incorporate sustainable development goals in your teaching

Why is this a good practice?

Sustainable development goals (SDGs) are a collection of 17 interlinked global objectives designed to be a "shared blueprint for peace and prosperity for people and the planet, now and into the future". The SDGs were set up in 2015 by the United Nations General Assembly with the objective of being reached by 2030. They are universal and tangible topics that cover most of the spectrum of human issues.

Challenge

The world is being torn by inequality and climate change while at the same time undergoing globalisation. To share the burden of global issues, the global community must act sustainably in all aspects of life, including teaching and learning.

Solution

To raise students' awareness and sensitivity on sustainability issues, it is sensible for educators to introduce SDGs in educational practices. The 17 SDG goals are further divided into 169 more specific targets that cover problems related to everyday life and the well-being of individuals and communities. As an educator, you can select a particular SDG related to the objectives and content of the course you teach and make it the focus of learning. This approach will enrich student educational experiences and will introduce an environmental, green viewpoint to educational outcomes.

Authors

Triinu Jesmin and Jaanus Terasmaa, Tallinn University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Introduce activities on redesigning processes for reducing emissions

Why is this a good practice?

This practice encourages students to think of innovative solutions for addressing SDG goals.

Challenge

Educational activities in all engineering curricula must raise awareness and build student skills for addressing the urgent need for reducing greenhouse gas emissions and managing air pollution. Students need to understand further the issues related to fossil fuel scarcity and the economic challenges related to importing petroleum products.

Solution

Design a learning challenge encouraging students to think innovatively about reducing gas emissions. An example of potential activity may be related to converting an internal combustion engine to an electrical. Ask students to prepare customised designs for different models of vehicles by using design thinking approaches through the ICT-INOV gamified design thinking learning platform. To help students understand the problem better, encourage them to explore existing internal combustion engine vehicles in various organisations and offices and study electric vehicle technologies. Ask students to analyse and simulate their designs by developing and testing a prototype of a converted vehicle.

Authors

Tri Ratna Bajracharya and Aman Shakya, Tribhuvan University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Encourage students to design for others, not themselves

Why is this a good practice?

This practice encourages students to work on challenges others face, not necessarily themselves.

Challenge

Design teams are called to solve real-world problems related to business, industry, or societal challenges. When selecting a problem to work on, it is natural for students to focus on issues that affect their own lives. For example, when asking a group of students to design a technology-enhanced solution for education, it is natural for teams to address often higher education learning challenges with which they are more familiar through their daily experiences. However, designers design solutions primarily for others and not for themselves. It is important to encourage students to address issues relevant to broad target groups, getting out of their comfort zone.

Solution

Ask students to explore problems related to other individuals or groups and not directly or indirectly themselves. For example, if the class objective is to design a technology-enhanced solution for education, ask students to address challenges faced by learners in preschool, primary, vocational, adult, or professional education rather than higher education. This approach will provide more growth opportunities for students as innovators, for example, in the context of problem discovery through research and interviews with stakeholders in other sectors that may bring to light new discoveries, ideation and problem-solving that integrate diverse viewpoints and evaluation of suggested solutions by engaging with broad groups beyond their circle of fellow students and academics.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Authors

Hariklia Tsalapatas, Olivier Heidmann, Emmanouil Anagnostakis, University of Thessaly

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Consider ethical implications and responsibilities in design

Why is this a good practice?

Students should always consider ethical constraints, such as the privacy of data or actors, while designing their solutions. Considering ethical constraints encourages responsible student behaviour.

Challenge

While apprehending a problem and drawing a solution, intricate concepts such as data privacy and responsibility may be ignored. This might create serious design issues with consequences for the present and future.

Solution

Encourage students to ponder ethical concerns while researching problems and ideating solutions. There might be cases where the design of a good solution may require considering trade-offs between ethical concerns and performance or any other non-functional property of a system. In this case, it is of utmost importance to stay on the ethical path, consider possible moral reflections of a potential solution and analyse the associated responsibility to ensure that the final solution addresses ethics in a human-centred way.

Authors

Irum Inayat and Iqra Yousaf, National University of Computer and Emerging Sciences

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Incorporate agile methods in design thinking.

Why is this a good practice?

Integrating agile design, popular in software engineering, with design thinking offers benefits of both approaches. The iterative and incremental approach of agile design fits well with the iterative nature of design thinking. Design thinking supports problem understanding and solution ideation, while agile methods facilitate iteration management.

Challenge

Iteration management and team role management are important design aspects that may be ignored while applying design thinking.

Solution

Encourage students to use a well-accepted agile method, such as SCRUM, in combination with design thinking to take advantage of incremental approaches towards introducing solutions that better address user needs after each iteration cycle. Encourage students to apply design thinking to developing a prototype during each agile sprint iteration. The two design approaches complement each other, offering value-adding benefits in outcomes.

Authors

Irum Inayat and Tabbasum Fatima Siddique, National University of Computer and Emerging Sciences

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Embody design through real practice: the case of Design Project for Orphans.

Why is this a good practice?

This activity involves a real-life design thinking activity that engages students to design better living experiences for orphans. It is a good practice because it involves students visiting the Orphanage Center in Kuala Lumpur, observing and working with children on learning activities, getting experience through immersion in actual daily life challenges children and caretakers face, and synthesising solutions. The project cultivated a sense of gratitude and created a sense of empathy for the community. Students were excited to help the orphans in the Orphanage Centre.

Challenge

When visiting real places, the design team has an opportunity to discover the actual problems that users face. Often, the team may discover that there are too many problems and issues to be solved. In the case of the Orphanage Center project, students discovered through immersion and observation that the problems faced are related to financing, education, health, emotions, and mental health.

Solution

Encourage students to prepare a list of user challenges, such as the Orphanage Center Project children and caretakers, and then rank them. Students can then select a specific issue that is highly prioritised and synthesise a solution by using ICT, a field that is most familiar to them. In the case of the Orphanage Center project, most students designed prototypes of mobile and IoT applications.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Authors

Dr. Nazean Jomhari and Dr. Raja Jamilah Raja Yusof

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Encourage students to develop project management skills

Why is this a good practice?

This practice encourages developing project management skills. Integrating design thinking principles into project management methodologies facilitates the creation of more inventive solutions, enhances user experiences, and boosts the accomplishment of project goals.

Challenge

A key challenge in teamwork is the proper distribution of work among the group members. It is difficult for the project supervisor to identify the work performed by individual project members. Improper workload distribution leads to burnout, missed deadlines, and low morale, ultimately resulting in poor project execution.

Solution

At the initial stage, distribute the overall work among team members equally. Use the ICT-INOV design thinking platform to identify the contribution made by each member through the platform's support to identify the contribution made by each member. This information will allow tracking of project progress and contributions made by each member.

Authors

Prof. Dr. Manish Pokharel, Dhiraj Shrestha, and Sameer Tamrakar, Kathmandu University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Deployment

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Build student teams in an effective way

Why is this a good practice?

This practice helps educators, instructors, or teachers overcome difficulties in managing student activities, particularly in their early experiences of applying design thinking.

Challenge

Not all students would opt to work in a group, preferring individual work through which they can achieve results faster and manage their work independently. On the other hand, some students may face difficulties researching a problem and need constant guidance.

The role of the teacher, mentor, or facilitator becomes important, particularly during the brainstorming activity for guiding students through the stages of generating ideas, evaluating ideas, and selecting for prototyping the idea that offers, based on criteria, the highest potential to address the problem in focus.

Solution

Provide students with additional activities focused on team building. The time spent in team building is an investment towards reinforcing working relationships and models among team members that will enable them to collaborate better and reach good results in all the phases of design thinking.

Authors

Michela Tramonti, Alden Meirzhanovich Dochshanov, Fabrizio Casadio, Libera Pezzano, EU-Track

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Build diverse and cross-functional teams.

Why is this a good practice?

This practice helps educators, instructors, or teachers overcome difficulties in setting up working groups in the first stage of the design thinking application.

Challenge

A homogeneous team may tend to share similar visions and adhere to preconceived ideas, reducing the chance to challenge the status quo and think creatively. A homogenous team may have a limited view of a problem. It may also lack diverse backgrounds and skills. This could lead to partial solutions or missed opportunities for innovation. In addition, in homogeneous teams, fewer conflicts may arise, but there may also be a lack of diversity of opinions and the ability to challenge ideas constructively.

The absence of diversity and cross-functionality in a design thinking team can hinder the team's ability to identify problems comprehensively, generate innovative ideas, and successfully implement solutions. Diversity is often seen as a key element in the effectiveness of the design thinking process.

Solution

Assemble diverse participants with different backgrounds, disciplines, and expertise areas. Cross-functional teams bring various perspectives, skills, and knowledge to the design thinking session, which can lead to more creative and holistic solutions.

Encourage collaboration and active participation from all team members. Ensure everyone has a voice and feels comfortable sharing their ideas and insights. Use facilitation techniques to promote inclusivity and equal participation.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Cross-functional teams can help identify blind spots and uncover unique opportunities for innovation. They can also facilitate the convergence of ideas from various domains, leading to more robust solutions.

Authors

Michela Tramonti, Alden Meirzhanovich Dochshanov, Fabrizio Casadio, Libera Pezzano, EU-Track

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Focus on specific design thinking steps in specific ICT courses for different types of learning strategies.

Why is this a good practice?

Students must go through the design thinking process to achieve learning objectives. Each design thinking step is important for the development of innovative solutions. Hence, no design thinking steps can be excluded from the learning process.

Challenge

Design thinking can be time-consuming to implement within a specific learning strategy. ICT courses can be very technical and fundamental. To achieve the best learning outcomes, design thinking must be applied to problem-based subjects that require innovative solutions. Design thinking includes multiple steps and requires longer learning sessions to maximise benefits. Instructors must have a complete understanding of the design thinking process to apply it to different types of learning strategies.

Solution

Design thinking can be applied in diverse ways. Educators can identify real-world problems related to their course and carefully integrate design thinking steps in classroom activities. A 1-hour tutorial introductory session can be used to present design thinking steps, which can later be implemented as part of the teaching and learning process. A full design thinking cycle can be completed with good results over a 7-week project-based learning plan.

Authors

Azah Anir Norman, Raja Jamilah Raja Yusof, and Saaidal Razalli Azzuhri, University of Malaya

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Create an activity that challenges students through time pressure

Why is this a good practice?

Time pressure is a gamification element that increases the intrinsic difficulty of a learning activity. The introduction of time pressure in learning utilises design thinking in an innovative, different, and playful way while creating challenges that motivate students.

Challenge

Some games include mechanics related to time management; players must solve challenges in a scheduled manner. This mechanic is used, for instance, in escape rooms. This is a highly effective mechanic for most individuals that fosters the player's motivation. The ICT-INOV platform can be used in a synchronous way so that the teacher releases time-stamped challenges that participating groups must release within a specific timeframe.

Solution

An educator has a lot of options for designing an interesting scenario by creating a set of challenges related to a societal problem close to the students' interests. The challenges should be related to the selected problem, encouraging students to research information, solve puzzles, and more. The higher the variation in selected challenges, the better.

Educators may further deploy a ranking of teams based on the time each group takes to solve a set of challenges. This mechanic introduces rewards in the form of recognition, motivating student engagement in learning.

Authors

Carlos Vaz de Carvalho and Paula Escudeiro, Porto Polytechnic

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Engage students in curriculum syllabus design.

Why is this a good practice?

This practice provides educators and students with a common, jointly agreed reference point that sets the stage for learning throughout the course. It ensures that the course addresses student interests. Upon completion of the course, students develop the knowledge and skills they consider important.

Challenge

To effectively design a course, educators must consider issues related to integrating motivation for students' learning activities, identifying prerequisite knowledge and skills, and defining learning objectives to be achieved by course completion.

Solution

As an educator, provide students with specific and clear instructions and suggestions for executing learning activities. Allow students to explore the course content and set goals related to their interests and needs. Then, encourage students to share their thoughts and ideas in groups to develop a set of achievable learning objectives. Encourage students to design prototype solutions to real-world problems in groups. This approach will contribute to developing both group collaboration and independent work capabilities.

Authors

Minh Tran and Huy Nguyen, John von Neumann Institute

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Reward students upon completion of each assigned task

Why is this a good practice?

This practice helps teachers motivate students and encourages them to join different class activities.

Challenge

Increasing student motivation and encouraging them to be active in class is a typical educator's concern. Students may lose the desire to work on specific assignments if they do not feel that their time and effort will be rewarded. For instance, students may ignore a reading assignment if that information is not required in tests or examinations. Moreover, students may not finish an assignment with the desirable quality if the time needed for implementation and effort is disproportionately high, considering rewards in the form of points or grades.

Solution

The educator can provide rewards or points for students after they achieve academic objectives. The rewards after each achievement can be small but different at each time to stimulate students' curiosity and eagerness to work and see what they can get. Another way is to give points for each achievement and, at the end of the course, reward the highest cumulative achievement in all assignments. Giving points is not only a good way to motivate students but also can help track progress.

Authors

Nguyet Thi Minh Dinh and Thang Xuan Nguyen, Hanoi University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Provide immediate feedback upon completion of each assigned task

Why is this a good practice?

Feedback helps students track their progress and self-access what they have learned.

Challenge

Students sometimes make errors but don't know why their response is wrong. In other cases, students may give the correct answer but still be uncertain about the quality of their solution.

Solution

Provide feedback upon completion of each assigned task. Feedback will help students understand why their response is correct or incorrect. Through the feedback, students can identify and track their own improvement. Feedback allows students to establish connections between the cause and effect of their choices and actions. It further allows them to determine the effort they need to invest to succeed. Moreover, immediate feedback for one student also helps the others learn from their friends' errors or accomplishments.

Authors

Nguyet Thi Minh Dinh and Thang Xuan Nguyen, Hanoi University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Empathise before you ideate

Why is this a good practice?

This practice helps educators, instructors, or teachers overcome some difficulties in applying the design thinking methodology, mainly during the empathy stage.

Challenge

The empathy phase is crucial to deeply understanding user needs, desires, and problems. If this step is superficially addressed, the solutions generated may not be user-oriented but based on vague assumptions or insights. Without a thorough understanding of user experiences, stereotypes or generalisations are more likely to manifest. This can trigger solutions that do not consider the different nuances of user needs. Superficially addressing the empathy phase can lead to solutions that do not address real user needs, resulting in additional costs in the long term for correcting errors or making substantial changes to solutions.

Solution

Grounding the design thinking process in empathy ensures that the solutions generated are user-centred and more likely to address real needs. The empathy phase is the foundation of the design thinking process. A thorough and genuine understanding of user needs is essential to generating successful solutions. Therefore, it is crucial to devote sufficient time and energy to empathy activities to gain an accurate and deep understanding of user experiences.

Start the design thinking session with a strong emphasis on empathy. Encourage participants to deeply understand the problem from the perspective of the users or stakeholders. This may be based on interviews, surveys, or observations to gain insights into their needs, pain points, and motivations.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Use techniques like persona creation, journey mapping, or empathy maps to synthesise and visualise the collected information. This helps participants develop a shared understanding of user experience and build empathy for their challenges.

Authors

Michela Tramonti, Alden Meirzhanovich Dochshanov, Fabrizio Casadio, Libera Pezzano, EU-Track

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Prototype frequently and iteratively

Why is this a good practice?

This practice helps educators, instructors, or teachers overcome some difficulties in applying the design thinking methodology, mainly during the prototyping stage.

Challenge

Prototyping takes time and resources. If prototypes are created without a clear understanding of goals or are not used to inform decision-making, resources can be wasted unnecessarily.

In addition, prototyping is an opportunity to gather feedback from users. If prototypes are not properly tested with users and feedback is not considered, valuable information on improving solutions may be lost.

Solution

Prototyping is essential in design thinking because it promotes experimentation, learning, and refinement throughout the process, leading to more innovative and user-centred solutions.

Encourage participants to start prototyping as soon as possible, even in the early stages of ideation. Rapid prototyping allows the quick testing and validation of ideas, helping teams to identify what works and what doesn't.

Make incremental prototype improvements based on feedback and insights gained from user testing. This iterative approach helps refine and evolve your solutions, increasing their effectiveness.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Ensure that prototypes are as tangible as possible. This can lead to more constructive discussions within the team and with stakeholders. It helps bridge the gap between abstract concepts and concrete solutions.

Authors

Michela Tramonti, Alden Meirzhanovich Dochshanov, Fabrizio Casadio, Libera Pezzano, EU-Track

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Test prototypes with actual users

Why is this a good practice?

This practice helps validate prototypes in real scenarios considering real user requirements.

Challenge

Designers may make a lot of assumptions and have personal biases when proposing solutions to problems. However, the problems do not belong to the designers; rather, they are the problems of the actual users or people concerned. The challenge is to understand real user problems or needs and introduce solutions that are actually practically feasible for the user in his/her context. Another issue is that designers may be too technology-driven or tend to suggest existing technical possibilities rather than the real need.

Solution

The instructor may encourage user-centered design during prototyping development. Multiple prototypes may be built if possible. Some real users or stakeholders should test each of the prototypes. The prototype may be a usable tool or system so users can engage with it. On the other hand, the prototype may simulate a typical example activity. Users may pretend to provide a response or output. After testing the prototype, users' reactions, responses, and feedback should be noted. The same prototype should be tested with multiple users, and the outcomes should be analysed. The observations should be noted and incorporated into the final solution design.

Authors

Aman Shakya and Tek Raj Subedi, Tribhuvan University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Increase student focus through rewards and motivation

Why is this a good practice?

Reward and motivation fostered through design thinking techniques and using the ICT-INOV digital learning platform increase student focus, engagement, and motivation to advance in their assigned projects or activities. Furthermore, it empowers students to track their progress, and it is easy for the instructor to track students' contribution to the activity if they do it in a group.

Challenge

Achieving and sustaining student attention and engagement in the classroom is becoming increasingly challenging, particularly as contemporary students have notably limited attention spans. Consequently, educators encounter a significant challenge in maintaining their students' engagement during lessons to ensure effective and advantageous teaching and learning experiences.

Solution

Incorporating specific strategies alongside physical activities significantly enhances the effectiveness of teaching and learning. The platform monitors and tracks student progress, facilitating efficient collaboration among students. Additionally, the platform can be used as an incentive for students to get extra marks for their final grades. This also serves as motivation for the usage of the platform. Students also can upload images showcasing their participation in various activities on the platform, allowing them to share these with their instructors. This platform allows lecturers to supervise all activities occurring within it and evaluate each student based on their updates regarding assigned tasks.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Authors

Azah Anir Norman, Raja Jamilah Raja Yusof, and Siti Hafizah Ab Hamid, University of Malaya

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Make team dynamics work well.

Why is this a good practice?

Design thinking is an iterative process that involves collaboration and co-creation, making team dynamics an essential aspect of successful group work. Successful team dynamics in design thinking-based group work involve a combination of factors. First, open communication is essential for encouraging honesty and sharing ideas without fear of judgment. Second, clear roles and responsibilities need to be defined to avoid confusion and overlapping responsibilities. Third, promoting collaboration and diversity can lead to innovation and creativity. Lastly, a culture of experimentation, using visual aids, and celebrating successes can all contribute to successful team dynamics.

Challenge

Bad team dynamics can lead to poor collaboration, communication breakdowns, decreased productivity, and low morale, ultimately negatively impacting the quality of the work produced by the team.

Solution

It is important to establish clear roles and responsibilities to improve team dynamics, encourage open communication, and foster a culture of collaboration, respect, and inclusivity. Regular check-ins and feedback sessions can also help identify and address any issues that arise.

Authors

Triinu Jesmin and Jaanus Terasmaa, Tallinn University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Encourage students to refrain from introducing solutions early in the design thinking process.

Why is this a good practice?

To make design thinking worthwhile and ensure the provided solutions are innovative, the inhibition of jumping to conclusions is essential.

Challenge

One of the main problems with designing novel solutions is going beyond the more obvious ideas to introducing truly innovative ones. Students may tend to be content with the first ideas that come to their minds and not bother with the challenge and potential discomfort of thinking out of the box. Therefore, most of the solutions they come up with are not really innovative or novel.

Solution

To make sure that participants do not propose the comfortable first idea that comes into their mind, encourage students to refrain from providing solutions in the first steps of design thinking. Remind them frequently that during the first two phases of design thinking, they are not expected to provide solutions but focus on understanding the problem. Use techniques that challenge students to think outside the box. For example, one good exercise is to write down 5 solutions, throw them away, and write 5 new solutions.

Authors

Triinu Jesmin, Tallinn University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Describe the problem in terms of pains, wants, and needs

Why is this a good practice?

This practice helps to define the problem and its impact within the context of the problem domain.

Challenge

While designing impactful solutions, it is important to define problems within the context of their impact on society or the relevant domain, considering the pains and needs of the users involved. However, students often tend to define problems solely from their own perspective, neglecting the broader implications within the problem domain and society. The challenge lies in defining the problem so that the proposed solution addresses all aspects of user pains and needs, thereby making a significant impact.

Solution

In the empathy phase of design thinking, students are encouraged to observe and understand the frustrations experienced by users and strive to solve their problems. They are advised to empathise with the context of the users' pains, needs, and desires. Through observations, personas, and empathy maps, students are prompted to analyse participants' pains, needs, and wants, gaining insights into their thoughts, feelings, and actions when encountering challenges. The outcome of this exercise is a well-defined problem statement that includes details about the effects of the problem, ensuring the development of impactful solutions for individuals and society.

Authors

Kamran Khowaja and Mutee U Rahman, ISRA University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Validate the problem definition and its impact

Why is this a good practice?

This practice helps students understand and validate the problem and its impact, increasing confidence in both the problem definition and the proposed solution.

Challenge

While researching problems to synthesise impactful solutions, students often fail to validate the problem and its effects within the problem domain and society. Consequently, their solutions deviate from addressing the actual problem, resulting in a lack of impact.

Solution

After the empathy phase and analysis of the problem and its impacts, students are advised to validate and support their problem definition and its impact through various means, including survey results, research reports, research articles, and news sources. This process not only boosts their confidence in finding solutions to problems and their positive impact but also answers the question of why they are proposing such solutions.

Authors

Kamran Khowaja and Mutee U Rahman, ISRA University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Generate an innovative startup idea by applying empathy

Why is this a good practice?

Individual components of the design thinking process can play an important role in problem-solving. One challenge in thinking about a startup idea is generating innovative concepts. Empathy plays a significant role in defining startup ideas and ensuring user-centric problems and their subsequent solutions. Upon completing the empathy process, one can generate numerous innovative ideas for potential startup ventures.

Challenge

Thinking about an innovative idea is a challenging task. Defining a startup idea that is user-centric and addressing the pain points and needs of the user is not an easy task. Empathising can provide insight into user-centric problems and their potential solutions. Combining empathy with idea-testing techniques like opportunity screens can define user-centric solutions.

Solution

In design thinking, empathy involves listening, engaging, and observing users to gain insight into their pains, desires, and needs. It aims to comprehend individuals' feelings, thoughts, and actions to understand the challenges they face. Through empathy, designers develop understanding and prioritise problems. Innovative startups focus on addressing user-centric issues. A problem can serve as the foundation for a startup idea.

Authors

Mutee U Rahman and Kamran Khowaja, ISRA University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Leverage visualisation tools

Why is this a good practice?

Visualisation serves as an effective technique for expressing ideas, allowing students to transform abstract concepts into tangible representations. By creating visual models, students gain clarity, discussions are facilitated, and deeper comprehension of the design journey is fostered.

Challenge

During the design thinking process, students need to express their abstract concepts and ideas to others. This step serves as a vital bridge between individual creativity and collective understanding. By expressing these concepts, students enable robust discussions, critical analysis, and informed decision-making. This collaborative exchange leads to the selection of the most promising and innovative solutions.

Solution

Students can enhance their ability to express ideas through visualisation when practising design thinking. This involves using a variety of design thinking tools to translate abstract concepts onto paper, making them more tangible and accessible. Some commonly used tools for visualisation are:

Mind maps. Mind maps are powerful visual representations capturing interconnected ideas and notions about a central topic. They are particularly useful during the ideation stage, allowing students to brainstorm and explore various facets of a problem. Mind maps organise thoughts and highlight the relationships and connections between different elements.

Empathy maps. Empathy maps delve into the perspectives of various customer personas. Students gain deeper insights into their needs and pain points by visualising users' feelings,

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

thoughts, and behaviours. Empathy maps encourage empathy-driven design and help students create solutions that truly resonate with users.

Storyboards. Storyboards are sequential visual narratives depicting a user's entire journey interacting with a product or service. They visualise each stage of the design process, from problem identification to solution implementation. Storyboards allow students to explore scenarios, identify pain points, and propose innovative solutions.

Figma® and other digital tools. Beyond traditional paper-based methods, students can leverage digital tools like Figma® for collaborative visualisation. Figma enables real-time collaboration, prototyping, and iterative design. It allows students to create interactive interfaces, wireframes, and mockups, bringing their ideas to life.

Authors

Nguyet Thi Minh Dinh, Hanoi University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Foster collaborative problem-solving with virtual design sprints

Why is this a good practice?

This approach leverages the digital platform to encourage teamwork, critical thinking, and creativity, closely mirroring real-world design processes and making learning more applicable and engaging.

Challenge

In the realm of design thinking, collaboration is key. However, fostering genuine collaboration remotely can be challenging. Design sprints, often used in product development, require team members to rapidly brainstorm, prototype, and test ideas.

Solution

Educators can use digital platforms to simulate virtual design sprints where students are grouped into teams to solve design challenges. The platform can facilitate brainstorming sessions through shared digital whiteboards, allow rapid prototyping with integrated design tools, and enable user testing through virtual feedback mechanisms. Challenges can be centred around real-world issues, enhancing relevance and engagement.

Authors

Carlos Vaz de Carvalho, Porto Polytechnic

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Implement reflective learning journals.

Why is this a good practice?

This practice encourages deeper learning and self-awareness, allowing students to connect their activities on the platform with broader educational goals and personal development.

Challenge

Reflection is a crucial component of the learning process, especially in design thinking, where understanding the impact of one's solutions is key. Digital platforms often focus on action, potentially neglecting reflection.

Solution

Educators can incorporate a feature for reflective learning journals within the digital platform, prompting students to periodically document their thought processes, challenges, insights, and learnings. These journals can be shared with peers for feedback or remain private between the student and the educator. Prompts can guide reflection on specific aspects of their projects or personal growth.

Authors

Carlos Vaz de Carvalho, Porto Polytechnic

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Create a conducive environment during brainstorming.

Why is this a good practice?

Design thinking works best when many different ideas are on the table. Brainstorming sessions guarantee a mix of viewpoints by bringing together people from various backgrounds. This stops solutions from being one-sided and can lead to fresh and groundbreaking ideas**.**

Challenge

The brainstorming session is an essential component of design thinking, facilitating ideas among the participants if conducted in a conducive environment. However, a few participants may dominate brainstorming while others hold back their ideas. Moreover, participants may be hesitant to share their unconventional ideas as they feel they might be criticised.

Solution

At the initial stage, appoint one of the participants to lead the brainstorming session to guide the discussion, ensure everyone participates, and keep all participants' energy levels high. The session should encourage wild thinking by avoiding criticism. As the session leader, take the initiative and handle the situation smartly. Use techniques like mind maps or brainwriting to get ideas flowing freely. These techniques can help establish connections and encourage students to build on each other's ideas.

Authors

Prof. Dr Manish Pokharel, Dhiraj Shrestha, and Sameer Tamrakar, Kathmandu University

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Conclusion

This report presents good practices targeting educators, aiming to support them in designing, enriching, and delivering educational activities that build the innovation capacity of their students. The information presented summarises the experience of ICT-INOV educators who piloted project outcomes with students in real-life learning contexts. It is openly shared with the higher education community to assist instructors and educational organisations in modernising educational practices through design thinking by integrating the ICT-INOV digital learning intervention.

618768-EPP-1-2020-1-EL-EPPKA2-CBHE-JP

Co-funded by the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.