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Interdisciplinary week in game design: a learning experience

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Abstract

Interdisciplinarity promotes competencies like asking meaningful questions about a complex problem, examine, and synthesize multiple sources of information, methods, and perspectives, in order to integrate knowledge and ways of thinking across two or more established disciplines to produce cognitive advancement. The Interdisciplinary Week of Game Design challenges the students to demonstrate an interdisciplinary understanding of a complex problem that students define, organized by teams, having as its starting point a given theme. Teamwork between members of different academic years favors the sharing of knowledge among peers with different aptitudes, technical skills, and degrees of competence.

Keywords: *Interdisciplinarity; project-based learning; soft skills; assessment.*

1. Introduction

The higher education system has been changing rapidly in recent years, with a greater emphasis placed on developing not only hard but also soft skills, the inter and intra-personal skills required to be effective in the workplace, a raised awareness about cognitive diversity and aligning aspects (cognitive, affective, behavior and context) of self-regulated learning (SRL). Two of the proposed approaches to developing these skills are through interdisciplinarity and project-based learning. Interdisciplinary competencies and soft skills, as the ability to understand issues in a holistic way, to connect both the analysis of problems and the devising of solutions with relevant disciplinary knowledge and methodologies, and to reflect on the role of scientific research in solving societal problems (Fortuin et al., 2013) can be highlighted on a curriculum vitae (CV) or in a job interview as contributions that a person brings to a future work team, cutting across academic and professional contexts.

In the interdisciplinary paradigm, students must ask meaningful questions about a complex problem, examine, and synthesize multiple sources of information, methods, and perspectives, from two or more disciplines, see how they intersect, and use reflective skills to carry out the solution of a problem or learning outcome (Ashby & Exter, 2019, Repko et al., 2019;). At its core is the ability to integrate knowledge and ways of thinking across two or more established disciplines to produce cognitive advancement in ways that would have been impossible or improbable through mono-disciplinary means (Boix et al., 2000). However, pedagogical approaches that challenge students to demonstrate interdisciplinary understanding remain relatively limited (Repko et al., 2019), and there is no single pedagogy that facilitates interdisciplinary teaching and learning (Ashby & Exter, 2019).

In recent years, interdisciplinary teamwork has become increasingly relevant in higher education (AWTI – The Dutch Advisory Council for Science, Technology and Innovation, 2022; Ashby & Exter, 2019). Interdisciplinary trends also surface in publication data, research agendas, and interdisciplinary innovation hubs (Klaassen, 2018). Various authors point out that at the meeting point of different perspectives there is a space that stimulates critical thinking, which allows the development of new knowledge, where the co-construction of learning is triggered (Akkerman & Bakker, 2011; Almasi, 2016). Engaging students in interdisciplinary experiences helps them develop higher-order metacognitive skills, guiding them to synthesize disciplinary knowledge to devise innovative solutions (Ashby & Exter, 2019). Thus, interdisciplinarity often materializes in global thematic areas such as sustainability, entrepreneurship, or big data, for example, where different disciplines come together to create solutions, products, or joint explanations of the world (Lam et al., 2014). This suggests a high level of breadth and complexity in the problems to be addressed.

As the implementation of the European Higher Education Area (EHEA) has evolved towards shifting the focus of attention from teaching to learning (Moya, 2017) and to the students'

own experiences (López-Pastor et al., 2013), the factors that allow students to be aware of their strengths and weaknesses have been studied. One of them is assessment and the way it responds to the students' need to judge their own practices and increase their autonomy and self-management skills (Calkins et al., 2018). The triple assessment approach, which combines self-assessment, peer assessment and teacher assessment in the same instrument, before the final grade of a given assessment procedure (Pérez-Pueyo et al., 2019), responds to this issue. Peer assessment is a very useful learning strategy for improving the feedback process in students (Kuo et al., 2017), fostering critical thinking (Topping, 2009), and studies have shown that it is remarkably robust in a wide range of contexts (Double et al., 2020). Self-assessment contributes to promoting self-regulation and awareness of learning by the student, helping train future responsible, critical, and reflective professionals (Pérez et al., 2022). Encouraging student participation throughout the assessment process also favors extrapolating the learning to various contexts.

Research has also suggested encouraging student innovation by supporting their autonomy during learning tasks (Martín et al., 2017). Project-based learning (PBL), which is based on the science of active construction of learning (Krajcik & Shin, 2014), emphasizes the construction of knowledge. Product creation is one aspect that differentiates PBL from other forms of learning. Product creation is important because it helps students integrate and rebuild their knowledge, discover, and improve their professional skills, and increase their interest in and ability to work with others. Therefore, the final products are the concentrated expression of various competencies that students can develop during PBL (Guo et al., 2020). Other authors have stated that the PBL method positively contributes to increasing student motivation to participate in the learning process (Pan et al., 2019).

Furthermore, understanding how teams effectively deal with continuously and rapidly changing contexts is an important issue for organizations. Teams capable of effectively responding to shifting conditions and aligning their member resources into processes that generate consistency in performance, are more beneficial to organizations than teams that fail to cope with changes in the environment. A moderate amount of cognitive style diversity has been shown to enable such team ability since having less doesn’t provide the cognitive capacity and flexibility to take on tasks that invoke different ways of encoding and processing information, while too much may negatively impact cooperation and coordination. Additionally, these team skills or collective intelligence, forecast the rate at which teams improve in their implicit coordination, processes which are exceedingly important in high-resistance organizations (Aggarwal et al., 2019). Therefore, interdisciplinary project-based learning can leverage valuable team skills awareness and perception that will support students in their future endeavors.

2. Interdisciplinary week

The Interdisciplinary Week (IW) is a period, in the middle of the academic semester, in which all students of the Game Design degree, at the School of Public Management, Communication and Tourism of the Polytechnic Institute of Bragança, divided into small teams, reflect on a specific topic, in the form of a response to an unstructured problem, defined by them, in the three fundamental areas of the degree: game design, computer science and visual arts.

The IW aims to develop skills that we can divide into four fundamental transversal competencies (Sá & Serpa, 2018) – problem solving, teamwork, communication, and self-management; and, furthermore, create positive and productive attitudes, solving problems as a team through collaboration, debate and the sharing of ideas, research, flexibility, and interpersonal skills.

It should be noted that the design and development of games implies demonstrating the thinking, language, and attitudes of different disciplinary fields that are related to each other, and an integrative approach is key to finding new solutions to problems in this context.

2.1. The process

The week begins with an informative session in which the objectives and skills to be developed are described, the topic to be explored is revealed, the daily goals to be achieved are presented, and the week's agenda is defined. and work groups are formed and registered.

The activities, using Discord as a complementing platform, are carried out in face-to-face, synchronous on-line moments and autonomous work, which can be on-line or face-to-face, with the aim of meeting the goal of each day:

Goal of day 1 – Problem Definition: through a brainstorming process and based on the references provided by the teachers and the research carried out by the group, the students define what they want to delve into within the proposed topic and record what they prove in the form of a question to examine;

Goal of day 2 – Executive summary: definition of what the student team intends to develop in response to the question they have defined, which can be a game, an animation, an app, a website, an interactive narrative, a service, etc.;

Goal of day 3 – Prototype development: through rapid prototyping, the student team begins to implement the core features and must register what they still intend to develop;

Goal of day 4 – Prototype and poster: refinement of the prototype and articulation of the result in the form of a poster;

Goal of day 5 – Final pitch: Through a 5-minute pitch, each the student team presents the problem, argument, project features, work process, and demonstration of results.

All results and processes are recorded in templates provided for this purpose and are reviewed throughout the design and development work cycle.

On the second and fourth day there are moments of interaction between peers, fostering dynamics between students that contribute to the construction of useful feedback to the design and development cycle and to the structuring of reflective skills that, in turn, will inform the formative evaluation.

During the week, teachers supervise the work from their perspective of the topic, for which they are invited to make a short presentation.

2.2. Assessment

The developed work is evaluated among colleagues from the same team and between teams, by all those interested in the developed projects, and by the coordinating committee, contributing up to 10% to the classification in all curricular units in which the student is enrolled in the semester.

In order to assess students' progress in the project's evolvement, quality feedback is sought every day, on the one hand to facilitate students' development and task improvement, on the other as a contributor to the quality of the student experience and as an enabler of team's identifying their strengths and weaknesses to further improve (Lizzio & Wilson, 2008). Assessment is understood as integral to the learning process and, as such, it is the locus of letting students formulate personal learning goals, activating prior knowledge to support debate, teachers informing students (collectively or individually) on what to accomplish next, as well as activating students as instructional resources for one another and as holders of their learning paths during the week, according to formative assessment strategies (Leenknecht et al., 2021). Therefore:

Feedback of day 1 – the student teams pitch the ideas discussed in the brainstorming process in order to define the problem and teachers give oral feedback in order to develop and improve the task;

Feedback of day 2 – each team registers the feedback resulting from the interaction with other teams and gives feedback to other teams about the conceptual results already achieved, as well as developing an Executive Summary for the project taking all collected feedback into account;

Feedback of day 3 – the students start prototyping, articulating their ideas in a product and pitching the first implemented features as well as identifying what they want to do; other

teams give structured feedback identifying a positive aspect, something to improve and also giving a suggestion about something that could be added;

Feedback of day 4 – teams test the prototypes from each other and register the feedback gathered from observation of testing and debate during the interaction;

Feedback of day 5 – on the last day teams publish a poster of the project and pitch the final results gaining feedback from those in terms of generated debate between teams as well as voting.

Hence, to complement what has already occurred in terms of assessment throughout IW, at the end of day 5's tasks the developed work is evaluated:

- from the student's perspective, by filling in a form with questions relating to the internal teamwork, interaction with other teams, the contributions and fulfillment of the tasks performed, and reflecting on learning throughout the process;

- from the point of view of all those interested in the developed projects, by voting for the ones they consider the 3 best projects considering the theme/problem identified, the originality, the degree of development, and the quality of the presentation;

- from the perspective of the coordinating committee, by evaluating all documentation produced during the process and the active participation of students.

3. Results

The IW has now been running for eight editions and has contributed greatly to the culture of the students and the degree in Game Design. The exploration of a topic allows unfolding research methodologies, supporting the double approach necessary for interdisciplinary thinking – having knowledge and having skills (Chatterjee & Das, 2021). Based on the iterative cycle of design and development, the learning process is itself iterative, with goals in which questions are asked.

Teamwork between members of different academic years favors the sharing of knowledge among peers with different aptitudes, technical skills, and degrees of competence. Widespread interactions between peers, as well as between students and teachers, combine to develop a critical stance essential to move away from notions of absolute knowledge and consider and apply different points of view and reconsider the strategies used within the project, favoring intellectual maturation of the students. The templates that support the autonomy of the students during the learning tasks in the IW prove to be sufficient scaffolding. They also enable a focus on personal characteristics, described in the literature as sub-competencies of interdisciplinary thinking: curiosity, respect, openness, patience, diligence, and self-regulation (Chatterjee & Das, 2021).

Table 1. Interdisciplinary Weeks that already occurred.

	Date	Theme	Number of students	Number of the projects
1st	26.11 to 30.11.2018	INTERCONNECTED	109	21
2nd	01.04 to 05.04.2019	(UN)USEFULL	88	15
3rd	11.11 to 15.11.2019	POST-HUMANISM	160	22
4th	26.11to 03.12.2020	VIDEOGAMES 2020 international conference	112	25
5th	06.04 to 09.04.2021	MEMORY	89	16
6th	06.12 to 10.12. 2021	FUTURES	128	23
7th	04.04 to 08.04.2022	MAGIC	95	18
8th	14.11 to 18.11.2022	DOPPELGÄNGER	127	22

The final results presented in the IW are usually divided into three types of artifacts – documentation, physical objects, and digital prototypes. As a concentrated expression of the various skills developed by the students, they are an incorporation of the reconstruction of their knowledge, a reflection of the discovery and improvement of their skills of ideation, critical analysis, discursive articulation, communication, and collaborative capacity. They also demonstrate productive moments in the student's academic itinerary.

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