

## Let IT Dance! Experience Computer Science with Dance and Music

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The underrepresentation of women in the IT sector is a persistent issue that hampers diversity and innovation. The project "Let IT Dance!" addresses this problem by aiming to inspire and engage girls and young women in the IT sector, and related subjects by letting them experience computer science (CS) with dance and music. This paper explores the objectives and strategies of the project, which include reducing the gender gap in IT interest, drop-out, and performance, simplifying complex IT and programming concepts, integrating innovative teaching concepts, developing a learning analytics platform, and raising awareness about cybercrime. The target group of the project spans from kindergarten to university level, as inspiring individuals for IT from an early age is crucial. By consciously integrating stereotypes and incorporating creative content, such as dance and music, the project seeks to shed a different light on computer science, to spark interest among girls and encourage them to pursue educational and professional careers in the IT sector.

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## 1. Introduction

Despite great efforts in research and teaching, as well as numerous initiatives aimed at inspiring girls and young women to pursue STEM careers, there persists a notable gender gap in the field of computer science (CS) [1]. Unfortunately, this gap has further widened in some areas in recent years, as evidenced by declining female enrollment rates. For example, the percentage of female students in CS at the Johannes Kepler University (JKU) Linz has dropped from 29% in 2019 to 15% in 2021. Similarly, the proportion of female students in the field of Artificial Intelligence (AI) has similarly decreased and in the field of mechatronics, it is only 9% [2]. The consequence is a lack of young female talent in IT professions. Based on the findings of the 2021 “Digital Economy and Society Index”, a significant portion (55%) of enterprises that engaged in recruiting or attempting to recruit ICT specialists faced obstacles in filling the available positions. Furthermore, alongside the issue of 70% of employees lacking sufficient (digital) skills, there exists a notable gender disparity, with women comprising only 19% of the ICT specialist workforce [3].

This paper introduces the ongoing project “Let IT Dance!” (Nov 2022-Dez 2023) (see Figure 1) as a novel approach to engage girls and young women in the IT field. Until October 2023, 63 workshops and training sessions were conducted involving 230 women and 640 girls (3-18y). The participants’ opinions and experiences were collected by questionnaires. The project is funded by the Federal Chancellery of Austria and carried out by the COOL Lab at the JKU [4], an innovative teaching and learning lab for students and (prospective) teachers, as well as the Institute of Business Informatics – Software Engineering. By combining traditionally feminine interests with IT and programming, the project aims to challenge existing stereotypes and create an inclusive environment that nurtures talent and potential.



Figure 1: Project “Let IT Dance!”

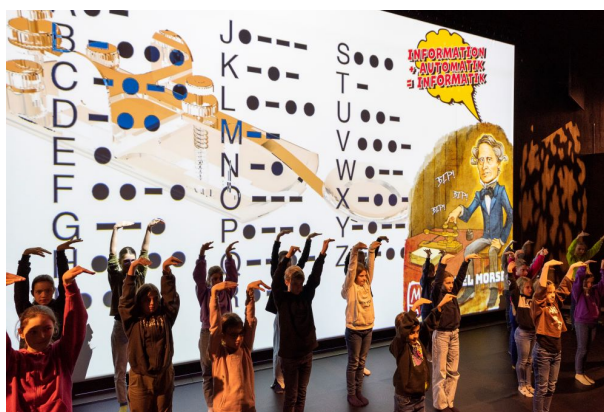
## 2. Breaking Barriers: Factors that Deter Girls from Choosing STEM Professions

What continues to prevent girls and young women from choosing STEM professions? The reasons are manifold and range from a lack of interest on the part of girls to still-existing stereotypes or misconceptions of CS to concrete differences in the self-concept and performance of students [5]. To address these obstacles, one potential approach is to introduce children to these topics at the earliest opportunity. Numerous studies indicate that early educational experiences have demonstrated a favorable impact on students’ subsequent selection of mathematics and science courses, as well as their career choices [6–9]. Additionally, studies show that introducing children to STEM at an early stage can ignite their curiosity and have a lasting impact on their career decisions

[7, 10, 11]. In the process of growing up, children's inherent curiosity and desire to understand the functioning of the world often wane [12]. These innate perceptions of natural and technical phenomena often differ from the scientific principles taught in school, which in turn become a primary source of learning obstacles in these fields [13]. Unfortunately, despite the existence of multiple projects and initiatives, the challenges of IT education and gender disparity have not been solved yet. The persistent gender gap in the IT sector poses significant challenges to achieving diversity, innovation, and equal opportunities.

### 3. Objectives of the Project

The project "Let IT Dance!" aims to achieve several key objectives to make a significant impact in the field of IT: (1) Generating interest among individuals, particularly targeting girls and young women through the integration of creative content (e.g., dancing and music), into workshops, training, and tasks (see Figure 2). (2) Addressing the gender disparity in the IT sector by actively working towards increasing female participation. By integrating activities such as dance and music into workshops and tasks, the project taps into subjects with "stereotypically" feminine connotations, capturing the attention of participants who may not have previously considered IT as an option. This approach aims to refute the assumption that CS is predominantly a male-dominated field and inspire girls to explore their potential in IT-related areas. But dancing and music are not only interesting and contained for girls [14]. Many cultures worldwide have traditional dances performed by all genders (e.g., Tango, Haka), highlighting the important role of dance in expressing cultural values and traditions. Traditional dance concepts often focus on female dancers showing a clear gender differentiation, however, this is often not the case with contemporary formats (e.g. Urban Street Styles) [14]. The same is true for music: The genres of "rock" and "heavy metal" have been male-dominated for a long time, however, this association is changing more recently due to an increasing number of female artists and fans [15].



**Figure 2:** Workshop & Show: Coding meets Choreography ©Nick Mangafas

Besides stereotypes that cause a gender imbalance, the "Let IT Dance!" project recognizes the challenges that often accompany learning IT and programming concepts, especially for individuals new to the field. By utilizing innovative teaching methods, and developing inclusive teaching and learning material, the project seeks to make difficult IT and programming concepts more accessible

and easier to understand. By incorporating creative content into programming lessons, the typically mathematically-oriented tasks are supplemented with more engaging and accessible activities. In order to be able to specifically address learners' deficits, a learning analytics platform is being developed as part of the project (available January 2024). This platform will enable the analysis of the learning behavior of both female and male students in programming classes. By processing errors made while solving programming tasks, the platform will provide teachers with valuable insights into areas where students encounter difficulties. This analysis will help teachers gain a comprehensive understanding of their students' challenges, enabling them to develop targeted materials that align with the individual competencies of the learners.

Another important focus of the project is to raise awareness about the alarming issue of cybercrime. In addition to the need for more skilled workers and the reduction of the gender gap, the project recognizes the importance of educating young people about cybercrime, such as sexting, sextortion, grooming, scamming, and phishing, and empowering them to become responsible digital citizens. Through educational initiatives, such as workshops and talks in schools, as well as teacher training, "Let IT Dance!" aims to inform and empower individuals to protect themselves in the digital world, fostering a safer online environment for all. Through these multifaceted objectives, the project aims to leave a lasting impact, inspiring and empowering individuals, especially females, while cultivating a safer and more diverse digital future. Therefore, this unique creative approach aligns with the essence of Citizen Science, as it encourages active participation and contribution by volunteers in a scientific or technological domain, aiming to bridge the gender gap and promote inclusivity within the IT sector.

#### **4. Preliminary Results**

The end of the project is in December 2024, however first questionnaire analysis as well as workshop and training observations show that the "Let IT Dance!" has a great impact on female participants. Preliminary findings show positive reactions of girls and young women towards IT (e.g., programming course with MakeyMakey and creating musical instruments was "fun, inspiring, and very exciting") and an enormous gain of information regarding dangers in modern music and dance apps (e.g., TikTok). In addition, created project materials (e.g., learning videos, Geogebra book) were accessed and used several times.

#### **5. Conclusion & Outlook**

The "Let IT Dance!" project serves as a significant step towards narrowing the gender gap in CS. By exposing children to IT at a young age, inspiring girls and young women through creative approaches, addressing the challenges associated with IT, and raising awareness about cybercrime, the project aims to increase the proportion of women in IT study programs and professions. With sustained commitment and continued implementation of similar initiatives, this project can create a future where the IT sector thrives on the talents and contributions of all individuals, regardless of gender.

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