



TURUN
YLIOPISTO

A! Aalto-yliopisto



DIGITAL GAMES and Quantum Physics in University

MPTL'26

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Laura Piispanen



1.
Motivation

Why Quantum Physics for university students?



Quantum Boom

Everyday life, politics and economy

Quantum workforce

Quantum Future



Challenges in educating students with Quantum Physics



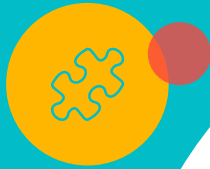
Interest

Conceptual change

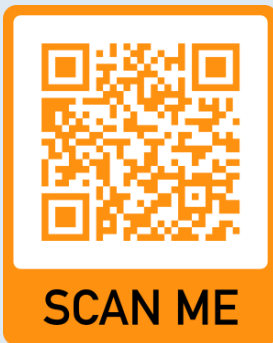
GAMES



2. Games



Quantum Games



Defined by Piispanen et. al.

”Quantum Games are games that reference the theory of quantum physics, quantum technologies, or quantum computing through perceivable means, connect to quantum physics through a scientific purpose or use quantum technologies.”

L. Piispanen, M. Pfaffhauser, A. Kultima, and J. R. Wootton, *Defining Quantum Games*, arXiv:2206.00089 (2023).



Ways of using quantum games



Event
or
Workshop

Online
studying

Course
or
Course with a
twist





Event or workshop



FUN IN THEORY



Annual event in the
University of Turku,

aimed to inform and attract bachelor students to **Theoretical Physics** courses, or master's programme.



SCAN ME



FUN IN THEORY

1. Introductory lecture
(Theory)

Information (2 h)

2. Playing games
(Fun)

Application (2 h)

3. Sozializing with
snacks

Reflection (1,5 h)



<https://quantumgame.io/>



Quantum game
with photons 2

<https://testtubegames.com/srel101.html>



Velocity Raptor

<https://quantumfrontiers.com/2019/07/15/tiqtaqtoe/>



Quantum
TiqTaqToe

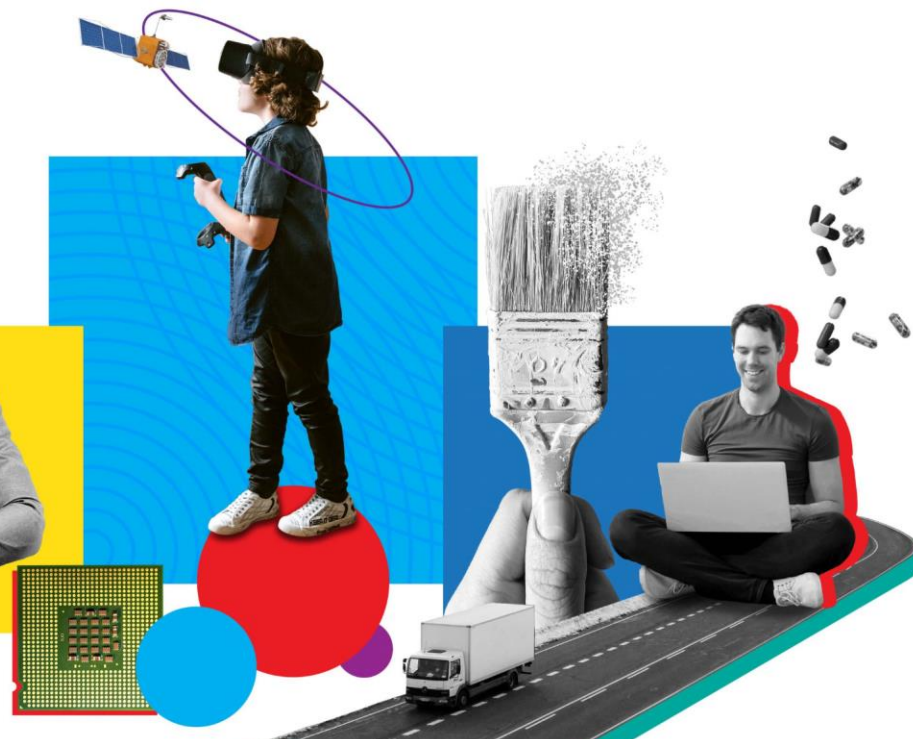


Online Platform

QPlayLearn



SCAN ME





Learn the foundations of quantum computing

and learn how a quantum computer works and how to work with a quantum computer.

LEARN MORE ABOUT QUANTUM COMPUTING IN THIS INTERACTIVE LEARNING EXPERIENCE

Quantum Computing

EXPLORE

LEARN MORE ABOUT QUANTUM COMPUTING IN THIS INTERACTIVE LEARNING EXPERIENCE

Quantum Computing Applications

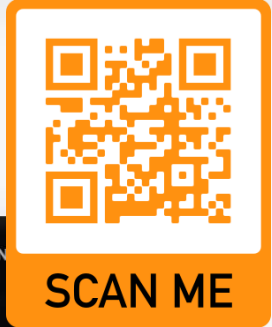
Start learning now.

Recommended level: Beginner

EXPLORE

LEARN MORE THE BASICS OF QUANTUM ALGORITHMS IN THIS INTERACTIVE LEARNING EXPERIENCE

COMING SOON



IQM
Academy





Quantum Games Course



Aalto Quantum Games



At Quantum Games university course, while creating games, students get to know both quantum physics and game development process.



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Meet the mentors of QG22!

POSTED ON 06/04/2022 BY QUANTUM GAMES

Quantum Games 2022 course, students create games based on their own ambition and or based on how... [READ MORE](#)

QUANTUM GAMES



Pilars of the course

1. Discord channel

For student-teacher, student-mentor interactions,

For updates on the progress,

For materials and homework

2. Homeworks and learning legacies

What quantum physics related have you learned?

What have you learned about game development?

3. Flexibility of learning

3-9 ETCS available





3.
Results

Fun in Theory:

- The event seemed to have **planted seeds for potential later growth of interest**. It affected participants' **attitudes and views** as well as the **topics of interest** related to quantum physics. These aspects became **more positive, realistic, rational, and versatile**.

Aalto Quantum Games:

- We received **positive feedback** from students about the source and its structure. They also seemed to effectively **learn at least some basics** both about quantum physics and game development.



4.
Take home
message

- The research about benefits of quantum games in quantum physics education is only “in its infancy” (Michelini et. al.) →

We need you to help developing this area of research.

- Get inspired by all the ideas and resources from this presentation.
- Use them!
- Let us all together do more research!

M. Michelini and A. Stefanel, Research studies on learning quantum physics, in *The International Handbook of Physics Education Research: Learning Physics*, pp. 8-1-8-34.





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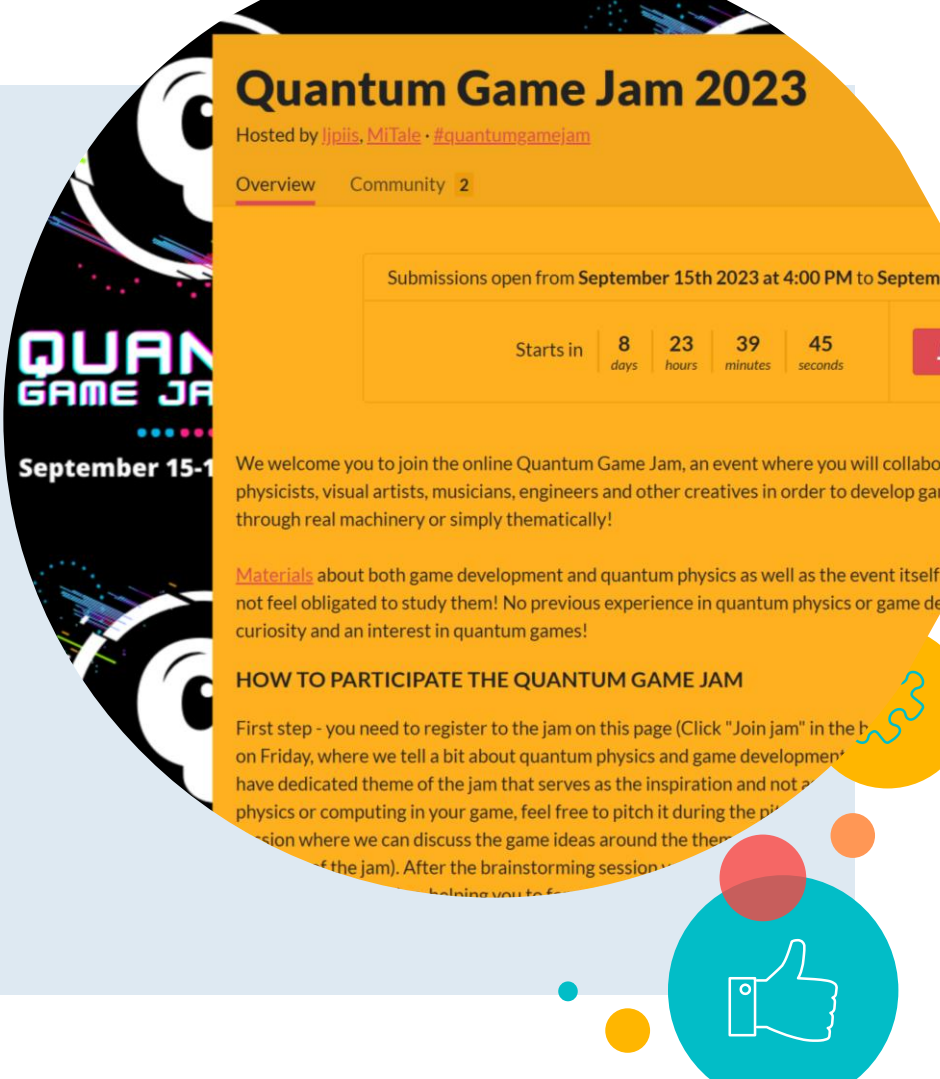
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Quantum Game Jam

Three-day game jam
15.-17.9.
aimed at
creating games
related to
Quantum Physics.



SCAN ME



Quantum Game Jam 2023

Hosted by [ljpils](#), [MiTale](#) · [#quantumgamejam](#)

[Overview](#) [Community](#) 2

Submissions open from **September 15th 2023 at 4:00 PM** to **September 17th 2023 at 4:00 PM**

Starts in	8 days	23 hours	39 minutes	45 seconds
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We welcome you to join the online Quantum Game Jam, an event where you will collaborate with physicists, visual artists, musicians, engineers and other creatives in order to develop games through real machinery or simply thematically!

[Materials](#) about both game development and quantum physics as well as the event itself. You do not feel obligated to study them! No previous experience in quantum physics or game development is required, only curiosity and an interest in quantum games!

HOW TO PARTICIPATE THE QUANTUM GAME JAM

First step - you need to register to the jam on this page (Click "Join jam" in the banner on Friday, where we tell a bit about quantum physics and game development). We have dedicated theme of the jam that serves as the inspiration and not a restriction. If you have physics or computing in your game, feel free to pitch it during the pitch session where we can discuss the game ideas around the theme (this is the main purpose of the jam). After the brainstorming session you can start developing your game, helping you to focus on the game development.





Thank you!

... and remember

