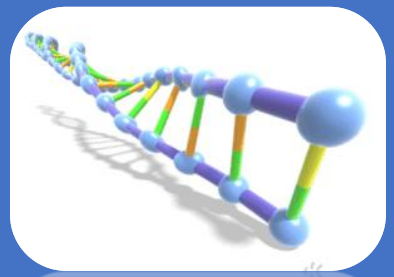


DANCING WITH DNA

Gamified learning for biology education

International Conference - The Future of Education - Firenze 18th and 19th June 2026

Sandra Iurescia · Jacopo Condò · Daniela Fioretti

OBJECTIVES AND OUTLINE

Objectives

- Share a gamified approach to teaching molecular biology
- Show how movement and rhythm make DNA replication tangible for pupils
- Present evidence from the Genova Science Festival 2025 edition

Index of contents

- Why this study: biology as an abstract subject
- Workshop design and learning mechanics
- Field setting and assessment strategy
- Student outcomes and teacher feedback

BIOLOGY IS ESSENTIAL, BUT OFTEN PERCEIVED AS ABSTRACT

Proposed response

- Gamification mechanisms transform pupils into nucleotides and enzymes through movement, rhythm, and cooperative play

Educational challenge

- Molecular processes such as DNA replication and cell division are hard to visualise in three dimensions

HOW "DANCING WITH DNA" WORKS

45 min

duration

Short format suitable for festival and school sessions

Up to 60

participants

Designed for primary and middle school pupils aged 8–12

2

facilitators

Biology-trained facilitators guided each festival session

1 beat

rhythm

"We Will Rock You" supported the choreographed replication phase.

Science Festival 2025 Genova - ItalY

The edition theme

"Weaves"

(in Italian "Intrecci")

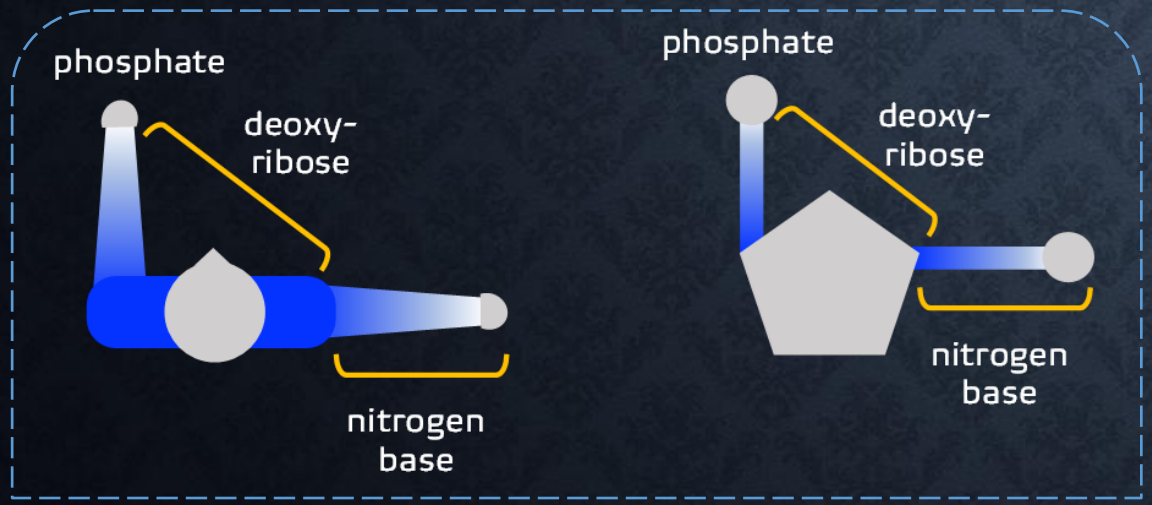
inspired the workshop

Workshop attendees
~1,000

Festival visitors
200,000 +

Educational settings
Students and General public

Using physical movement to interpret a segment of DNA



Appropriate yet simple materials

SCIENTIFIC CONTENTS INCLUDED WITHIN THE GAME MECHANICS

Genetic code language

colour-coded nucleotide tiles

=

complementary pairing rules A–T / C–G

Replication steps

enzymes tiles

=

helicase, polymerase, and ligase roles

Physical modelling

pupils form parallel lines

=

double helix

Speed and Accuracy

incorrect pairing

=

mutation

Assessment strategy

GETTING FEEDBACK WITH CHILD-FRIENDLY TOOLS

5-point Likert scale questionnaire

Open comments

Facilitator observation

PRIMARY PUPILS REPORTED THE STRONGEST GAINS

Q1 prior knowledge

3.23 *vs* 2.70

Primary school mean exceeded middle school by 0.53 points.

Q2 perceived learning

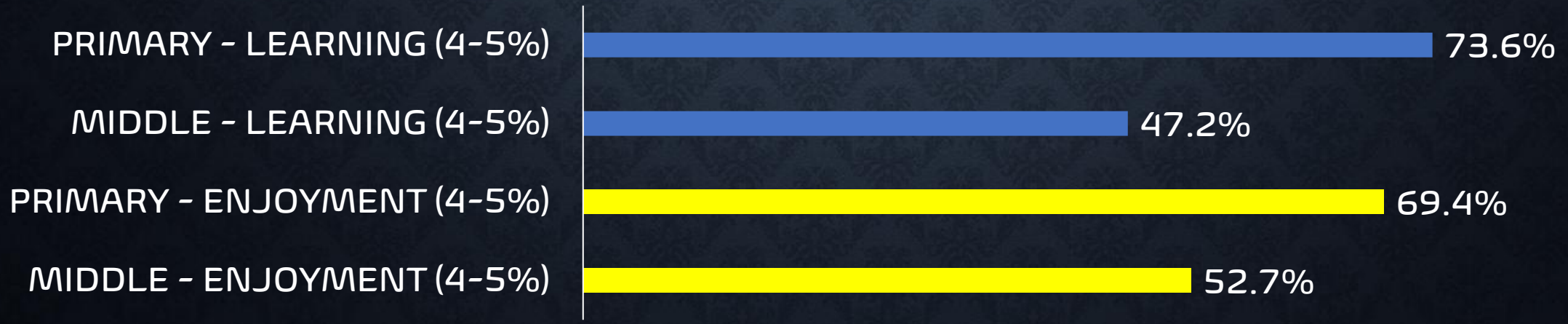
3.89 *vs* 3.14

Largest gap: +0.75 points in favour of primary pupils.

Q3 enjoyment

3.81 *vs* 3.35

Enjoyment remained positive in both groups, but higher in primary school.



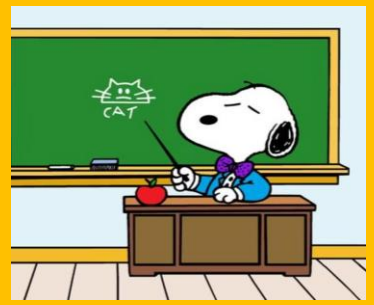
TEACHERS VALUED THE PRACTICAL COMPONENT MOST

4.18

PRIMARY
teachers' satisfaction with practical part

MIDDLE
teachers' satisfaction with practical part

3.99

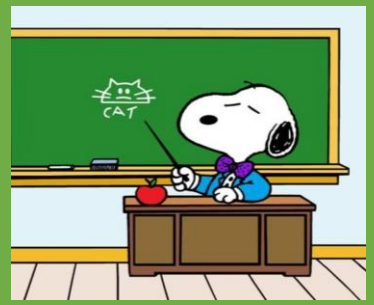


4.11

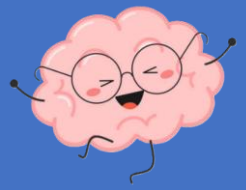
PRIMARY
teachers on understanding DNA

MIDDLE
teachers on understanding DNA

4.00



WHY THE FORMAT WORKED



By using their bodies and the space around them, children were able to give form to molecular processes

Embodied cognition

The activity required coordination, rule-following, and collective problem solving

Cooperative play

Rhythm, role-play, increased enjoyment and supported perceived learning.

Emotional engagement

TAKE-HOME MESSAGES

Student engagement

Gamification makes the fundamentals of molecular biology accessible, while keeping the scientific principles intact

Educational tool

Low-cost materials and a scalable design make the workshop transferable to regular school curricula

THANK YOU FOR YOUR TIME!

Sandra Iurescia

Researcher
Institute of Translational Pharmacology
CNR - Italy

Jacopo Condò

Researcher
eTwinning National Unit
INDIRE - Italy

Daniela Fioretti

Researcher
Institute of Translational Pharmacology
CNR - Italy