

Einstein-First

Every child has the right to share our best
understanding of physical reality

Einsteinian Physics Education Research Collaboration (EPER)

ARC Centre of Excellence for Gravitational Wave Discovery, OzGrav

LIGO Scientific Collaboration Education and Public Outreach Working Group

21st August 2020

The Einstein-First Website

The revamped Einstein-First website is now live: <https://www.einsteinianphysics.com/>

We hope that everyone involved in the Project will bookmark the site for easy access to the latest news and secure access to the curriculum resources as they are being developed.

One-week program at Little Grove Primary School in Albany

Prof. David Blair spent a week at Little Grove Primary School in Albany trialling lessons with Years 3 – 6. The school made a beautiful space-time simulator for teaching gravity. Students had also lots of fun learning about heat and light. We would like to thank especially Deputy Principal Julie Blogg for making this all possible.



Photo 1: Year 3 students learning about black holes on the space-time simulator setup.

Lesson plans for primary and secondary schools

The Einstein-First team's draft lesson plans and PowerPoints for primary and secondary schools are being placed in a secure area of the website. Lesson plans for Year 3 (*Hot Stuff* topic [heat] and *Shiny, Hot and Sticky* [Chemistry]) and Year 7 lessons are available. Please contact Jyoti Kaur at tejinder.kaur@uwa.edu.au for the password.

The lesson plans for Years 4 – 6 and 8 – 10 are under development. They will be made available on the website once they are ready.

Primary school teachers' workshops at UWA

The team has commenced training workshops with both primary and secondary school teachers. We ran a primary school workshop in late term 2 to discuss the Year 3 *Hot Stuff* at UWA. The team discussed the lesson plans with the teachers and went through related activities.

Lesson plan feedback

We have been very grateful for feedback from teachers. We would especially like feedback about whether the lesson plans are too complex or too long and how we can improve them.

Secondary school teacher's workshop at Thornlie High School

On Monday the 20th of July, Shon and Jyoti led an educational workshop on Einsteinian physics for a group of 13 teachers. This workshop included teachers of Year 7, 8, 9 and 10 science. We would like to thank Charlotte Rebello from Thornlie High School who has been a driving force in promoting the Einstein-First project with her school and has offered many ways to implement Einsteinian physics topics. The team shared the Year 7 lesson plans with the teachers and went through a few related activities.

Please let us know if you are interested in accessing these resources and being trained in their use.



Photo 2: Teachers at Thornlie High School with the Einstein-First team

The Project has ethics approval from Catholic Education

In addition to the UWA Ethics requirements which the Project has satisfied, Western Australian Public and Catholic systems both require separate ethics approval to conduct research in their schools. The team has submitted ethics applications to them and received approval from Catholic Education to conduct research in Catholic schools. We are waiting on the decision from the Department of Education and anticipate this will be provided in the near future.

Information session for Catholic and Independent Schools

An information session about the Einstein-First Research Project will be held on Tuesday afternoon, 1st September at UWA. Details are as follows:

Date: Tuesday 1 September 2020
Time: 2.30pm to 4.30pm
Location: G18, off main foyer of Physics building

Program outline:

- Background and introduction to the Einstein-First initiative
- Exploration of the curriculum resources (Years 3, 5 and 7)
- Exploration of a sample of the learning activities
- Question and answer session
- Next steps

A separate notice with registration details will be sent to all Catholic and Independent schools.

Updates from international partners

As COVID-19 has impacted researchers worldwide, like us, our international partners have experienced difficulties progressing their respective projects. Below are the updates received from the Einstein-First partners.

Italy: Prof. Matteo Ruggiero from Torino reports: During a workshop organised by INFN (National Institute for Nuclear Physics) focusing on physics for children, Matteo gave a talk about teaching Einsteinian physics in primary school, based on the 2019 intervention in Turin, performed by Sara Mattiello for her graduation thesis. There was great interest for the results obtained and the group in Turin is planning, together with other people in Italy, to organise a primary school teachers' training program on modern physics. After the school closure due to the lockdown, hopefully new interventions will be organised during the next school year.

Scotland: Prof. Martin Hendry from Glasgow reports: Once things return to “normal” later this year, with high school teaching and outreach programmes resuming, I would hope to be able to bring more news from Scotland. By then, for example, I would hope to have a clearer picture of how schools are adapting to the remote teaching of relativity and quantum mechanics in our high school syllabus.

Germany: Prof. Ute Kraus and Prof. Corvin Zahn report: The physics department at Hildesheim University, Germany, runs the project Spacetime-Travel to advance the visualization and the teaching of relativity. Current work includes the development of new teaching units on neutron

stars and on wormholes. Also, new teaching material is being developed in the form of virtual sector models that can be handled interactively.

Since, due to the pandemic situation, we cannot now invite secondary school students to the university, we are developing online units so that we can continue to test our approaches. Contributing to this work are six bachelor and master students with their theses that our group is supervising at the moment.

The current members of the Spacetime-Travel Project are Ute Kraus, Stephan Preiß, Thomas Reiber, Christian Vogt, Sven Weissenborn, and Corvin Zahn.

Norway: Prof. Ellen Henriksen reports: In Norway, the national curricula for all school subjects are under revision, which means that a new physics curriculum for upper secondary school will be implemented during 2021-22. The latest draft (February 2020) included quite detailed learning goals within special relativity, but no general relativity. Institutions and individuals are invited to contribute to the curriculum development process through hearings, and the physics education group at the University of Oslo has argued for continued inclusion of general relativity, both through the official hearing process and through social media. We do hope to convince educational authorities, with support in international research and development within "Einsteinian physics", that general relativity deserves a place in school physics education.

Interested in joining the project?

If you are interested in running Einstein-First programs in your classrooms and have not sent us an expression of interest yet, please feel free to contact us.

The Einstein-First team is looking for PhD and Masters students. We have received an expression of interest from five teachers who want to contribute to this research by joining either as Masters or PhD students. We are still looking for more. If you are interested in joining us, you still can do so. Please feel free to contact project coordinator Jyoti Kaur at tejinder.kaur@uwa.edu.au. If you know of anyone else who might be interested, please pass on our details to them.