# InterED

Report Prepared by

CITIZENS IN POWER

# Introduction

According to the Merriam-Webster dictionary, "Interdisciplinary" refers to integrating and comparing insights and methods from two or more academic, scientific, or artistic disciplines. Interdisciplinarity in education involves establishing connections between ideas across different subjects, fostering critical thinking, communication, and analysis skills. This approach has been implemented across various schools in Europe, particularly in Scandinavian and Northern countries, and is considered an emerging trend in enhancing teaching methodologies. School interdisciplinarity uses knowledge in an educational perspective; it aims to train social actors by creating the most appropriate conditions to encourage and support the development of integrative process and the appropriation of knowledge as cognitive product by students, which requires and adjustment of school knowledge at the curricular, didactic and pedagogical levels.

This report aims to provide an overview of 15 references and resources on the topic of interdisciplinary approaches and phenomenon-based learning. The report will address important questions such as how interdisciplinarity was achieved and implemented, the impact on students and teachers, and the challenges encountered during implementation. We will examine various studies, academic resources, and curricula from different countries and disciplines to ensure a comprehensive perspective and develop our Compendium structure. Furthermore, we will analyze a country-case study, Finland, which has adopted interdisciplinary approaches in their official curricula.

# References and Resources

## A Study on Interdisciplinary Teaching Practices: Primary and Secondary Education Curricula by Kanmaz, Ahmet (2022)

This study was carried out in Turkey and explores the advantages of interdisciplinary teaching practices in primary and secondary education curricula. The study also examines the level of use of interdisciplinary approach and its place in the curriculum. Interdisciplinarity is shown to provide numerous benefits to students, including connecting them to real-life situations, providing a holistic approach through phenomenon-based learning, enhancing their academic performance, and enabling active learning. However, educators may face some challenges, such as moving away from course goals, time constraints, and limited applicability in some disciplines/fields. Educators used interdisciplinarity to connect various subjects and disciplines in a study on interdisciplinary teaching practices in primary and secondary education curricula. The interdisciplinary approach was applied in subjects such as Mathematics, Turkish language, Science, Social studies, Music, Art, Geography, and Atatürk and the Republic studies. This approach created a multidimensional and holistic teaching and learning process, allowing students to connect concepts and skills across different subject areas.

## What is Phenomena-Based Learning and How Does it Engage Students by Active Learning (2023)

Phenomena-based learning is a teaching approach in science and engineering that uses real-world phenomena or complex problems as the basis for teaching and learning. This method of teaching is grounded on the idea that students can better understand scientific concepts by investigating events that happen around them in their daily lives. Engineering involves designing solutions to problems that arise from phenomena while using explanations of phenomena to design solutions. Therefore, phenomena serve as the context for both the work of the scientist and the engineer.

An example of that is the following: If it's something fun, flashy, or involves hands-on activities, it must be engaging; While using PhenoBL is transformed to: Authentic engagement does not have to be fun or flashy, instead, engagement is determined more by how the students generate compelling lines of inquiry that create real opportunities for learning.

## Study of an Interdisciplinary Didactic Model in a Secondary Education Music Class' by Cuervo Laura (2018)

It took place in Madrid Territorial Center for Innovation and Training took place in 2012 to 2013 for the Music classes. In the study on the interdisciplinary didactic model in secondary education music class, teachers collaborated and integrated various subjects to create a holistic learning experience for students. Interdisciplinary approach helped students connect concepts, enhanced creative and critical thinking, promoted self-confidence and self-sufficiency, and reinforced student-centered curriculum with practical creative activities. The study found that interdisciplinary didactic model not only enhanced the students' musical composition skills but also contributed to their overall development in terms of creativity, critical thinking, and self-confidence.

## Phenomenon-Based Approach to Teaching Russian as a Foreign Language in the Cultural Context'

In the context of learning a foreign language, the PhBA is a cross-disciplinary approach as it can be applied to assist foreign language learners in using the topic to learn a foreign language. The progress that took place is the following:

Students ask a question that relates to real life communication that is of personal interest (e.g. celebrating holidays in a foreign country). It is usually done by developing an "inquiry" question around this topic that begins with either a "how", "why", etc. Students themselves come up with the question or the problem they want to investigate that pertains to the activities they are engaged in. At its best, the PhBA in learning a foreign language fosters students' greater engagement in learning new knowledge and skills because they are working towards what interests them personally.

## Rhetoric, Reality, and Possibilities: Interdisciplinary Teaching and Secondary Mathematics by Woodbury (1998)

This study explains how to make a lesson interdisciplinary. It was developed by 1998 and was based in two categories, Alberty's Type–Two and Type–Three cores and describes a general education curriculum in which two or more subjects are systemically correlated or focused. In a Type–Two Core, teachers of two or more subjects plan to show the interrelationships among their subjects, often by studying, for example, epochs of time or by relating the teaching of their specialities to an overarching theme, such as Living in the Community. For example, in maths, it can be done in algebraic and geometric ways of considering a problem and by providing real–world contexts for problem–solving. Alberty's Type–Three Core describes a curriculum in which two or more subjects from different fields of knowledge are unified into a single course, usually taught in a larger block of time. An example of Type–Three Core was high school following an A/B block schedule in which 11th and 12th grade students could take a unified studies course on A days and four other courses on B days.

## Interdisciplinary Approaches to Physical Education: A Systematic Review by Carrete-Marín, Núria, and Francesc Buscà Donet (2023)

This study aims to provide an overview of research articles published in the Scopus, WoS and ERIC databases, from 2000 to 2022, related to the interdisciplinary approach of Physical Education (PE) subject to summarise the benefits that this approach can offer students. In the studies examined the interdisciplinary approach was intended to promote the development of motor skills or sports techniques but also that is, an understanding of movement about the human muscular and physiological systems –through alternative physical activities such as climbing or a specific methodology. The analysed articles have reported results related to achieving values and soft competencies in any context or curricular area. However, it is not possible to confirm that the interdisciplinary approach could be applied in every classroom integrating the movement as a pedagogical method to achieve all these contents of other disciplines narrowly related to PE or movement.

## Interdisciplinary Learning: Addressing the Implementation Gap by Harvie Julie (2020)

This article emphasises four elements when considering epistemological Interdisciplinary learning: Pluralism is the epistemological framework that should be able to account for multiple forms of disciplinary understanding on their own terms; Relevance – the framework should be relevant to the phenomenon of IDL and illuminate the processes of interdisciplinary integration; Explanatory – it must take account of how knowledge advances and shed light on the essential dynamics of learning; Quality assurance – it should be a framework which puts forth robust and relevant standards of acceptability across interdisciplinary endeavours. This article provides a guide to planning an interdisciplinary learning session. Briefly, when planning an IDL activity, first decide if it will be student–centered or content–centered. Identify a relevant and purposeful problem or challenge. Think about which disciplines students will need to use. Design the task to be meaningful and relevant. Encourage group work and self–direction. Assess the learning by considering if knowledge from multiple disciplines has been applied, if disciplines have been integrated, and if there is evidence of increased knowledge and understanding.

## A Guide for Interdisciplinary Teaching and Learning by Anna Sudderth

Interdisciplinary teaching and learning is exactly what it sounds like: students combine learning from multiple disciplines to come up with new ways to think about issues and solve problems. Methodology:

- **Pre-instructional planning**: Careful topic selection and the development of an action plan, including notes and open-ended questions to guide the classroom experience.
- **Introduction of methodology**: The concept of interdisciplinary learning, its importance, and its differentiation from discipline-based learning should be explained. Examples of successful interdisciplinary work can be shared.
- **Classroom application**: Students can explore questions together through an interdisciplinary lens, utilizing insights from different disciplines.
- **Interdisciplinary thinking**: Students can practice this by considering a problem through one discipline, then using knowledge from a different discipline to inform their analysis and find a solution. Group work is recommended to encourage collaboration and diverse perspectives.
- **Feedback provision**: To evaluate student performance, a detailed rubric can be used to assess their understanding of the structure and analytical framework of the relevant disciplines and their integration of knowledge across these disciplines.
- **Assessment**: Regular self-evaluation can be encouraged by having students rate their ability to identify and apply multiple relevant disciplines, synthesize insights from these disciplines, and integrate ideas across them.

## Developing Phenomenal Learning: A toolkit for implementing Phenomenon-Based Learning as part of a future-proofed SDG HE curriculum By Lee, Cuthbert, Jones-Devitt, Arnold & Waterhouse (2023)

Phenomenon-Based Learning (PhBL) can be implemented by following these principles: interdisciplinary approach, event or phenomenon-centered learning, enquiry-based and student-led learning, contextual learning, promotion of transdisciplinary learning, and skill development. By incorporating these principles, educators can effectively implement PhBL, fostering a more engaging and impactful learning experience for students. The implementation of PhBL involved recruiting students from two institutions, introducing them to the concept of learning based on real-world phenomena, and fostering a student-centred and collaborative learning environment. Students were encouraged to take the lead in exploring interdisciplinary connections, asking questions, and seeking solutions. The focus was on developing students' skills as lifelong learners through self-reflection, awareness, and engagement in transdisciplinary learning. Feedback sessions and discussions with practitioners further enriched the implementation process, providing valuable insights and models to enhance the PhBL experience in higher education.

## The What, Why, and How of Phenomenon-Based Learning By Viviana Nielsen and Anna Davies (2018)

Phenomenon-based learning is an interdisciplinary learning approach that involves presenting students with a real-world phenomenon, such as the recent increase in hurricanes in the United States, the bee population decline, the Genova bridge collapse, or the development of more aerodynamic swimsuits. The students then investigate the phenomenon by generating their own questions, researching relevant facts, and providing a solution or answer. Throughout the process, teachers guide the students, provide scaffolding, and assist with the complexities of the investigation. The above article provides some key to successfully develop of PhenoBL. When developing a phenomenon-based learning unit, choose a real-world phenomenon that students can relate to. Teach basic concepts before starting the project. Work with an open schedule to use skills across different subjects. Facilitate student-led learning and be open to different ways students tackle the problem. By doing so, you can create a successful phenomenon-based learning unit that engages students and encourages them to take an active role in their education.

## Students Learning Agroecology: Phenomenon-Based Education for Responsible Action by Østergaard, Edvin, Geir Lieblein, Tor Arvid Breland, and Charles Francis (2010)

In the article, Phenomenon-Based Learning (PhBL) was implemented in the agroecology program at the Norwegian University of Life Sciences by emphasizing three key aspects: the natural phenomenon or subject being taught, the students and their learning activity, and connecting these two elements with the teacher's teaching and self-reflection. The PhBL approach focused on providing students with real-world experiences through case studies that allowed them to interact with people and learn from their lived experiences outside the university environment. This hands-on approach aimed to bridge the gap between theoretical knowledge and practical application, encouraging students to engage actively in the learning process by reflecting on their individual experiences and perceptions of the course content and pedagogical methods. Through reflection sessions, learning logs, and client documents, students were able to deepen their understanding of agroecology and develop responsible actions based on their interactions with various stakeholders and learners both within and outside the university setting.

## Interdisciplinarity in US Schools: Past, Present, and Future by Mansilla, Veronica Boix, Yves Lenoir, and Julie Thompson Klein (2010)

This article examines the historical evolution of the concepts of interdisciplinarity and integration in American education. After 1983 the National Commission on Excellence in Education argued that in order to prepare American youth for a rapidly growing competition for markers and leadership with Japan, Europe, Canada and other post-industrial societies, the educational system needed to produce much better educated people.

## Interdisciplinary Secondary-School Workshop: Physics and Statistics by Tóth, Péter Fejes, Péter Vankó, and Manfred Borovcnik (2019)

The paper describes a teaching unit of four hours with talented students aged 15–18. The workshop was designed as a problem-based sequence of tasks and was in- tended to deal with judging dice, whether regular or loaded. The interdisciplinary approach in the context of Physics and Statistics was implemented in the workshop through a combination of theoretical concepts and practical experiments involving dice. Students engaged in practical tasks involving the movement of dice (physics aspect) and statistical analysis to determine irregularities in the dice (statistical aspect). By combining these activities, students could see the direct application of both disciplines in solving a real-world problem. The workshop included statistical calculations and simulations using Excel to analyze the outcomes of dice rolls. This data-driven approach helped students understand how statistical tools can be used to make decisions based on empirical evidence. Through simulations and discussions, students realized the importance of sample size in statistical analysis. They learned that a small sample size may not provide reliable results, leading to incorrect decisions. This reflective learning experience highlighted the nuances of statistical inference. By combining elements from physics and statistics in a cohesive manner, the workshop provided students with a comprehensive learning experience that bridged the gap between theoretical knowledge and practical application.

## Marcus Guido. '10 Interdisciplinary Teaching Activities + Design Steps | Prodigy', 1 June 2017. https://www.prodigygame.com/main-en/blog/interdisciplinary-teaching-activities-examples/.

This article provides a step-by-step guide on how to implement interdisciplinarity in school curricula by providing 10 examples of quick and easy interdisciplinary activities. Then it provides a lesson plan on how to design interdisciplinary Units in 5 steps composed of:

1. Asses Students and Setting.

2. Create an Organizing Centre
3. Develop Essential Questions
4. Plan and Run Activities
5. Review student performance and the Unit itself

## Towns-Belton, Danielle R. 'Teachers' Reported Use of Phenomenon-Based Learning in Secondary STEM Classrooms'. Tennessee State University, 2022.

Danielle R. Towns-Belton's dissertation on Teachers' Reported Use of Phenomenon-Based Learning in Secondary STEM Classrooms found that teachers tend to select activities based on the level of administrative support they receive. The availability of resources also appears to influence the rigor of the activities chosen. Teachers choose activities that capture students' attention and interest based on their academic background, hobbies, and culture. STEM literacy is mainly promoted through journal articles, although other options are available. These findings reveal how teachers implement classroom phenomenon-based learning strategies and the factors that influence their choices and practices. The dissertation by Danielle R. Towns-Belton titled 'Teachers' Reported Use of Phenomenon-Based Learning in Secondary STEM Classrooms' provides recommendations for implementing Phenomenon-Based Learning in secondary education. The recommendations are as follows: Ensure that teachers are adequately trained to implement Phenomenon-Based Learning in their classrooms.

- Encourage teachers to select activities based on administrative support, as more resources lead to more rigorous activities.
- Advocate for teachers to choose activities that align with students' interests, including their academic pursuits, hobbies, and cultural background.
- This text provides recommendations for promoting STEM literacy through various means beyond journal articles, offering alternative options for enhancing student learning.

The recommendations aim to support educators in effectively implementing phenomenon-based learning strategies in STEM classrooms, fostering student engagement and understanding of real-world applications of STEM concepts.

# Case Study – Finland

Interdisciplinary approaches have played a significant role in Finland's educational and policy-making landscape. The country has been recognized for its innovative and successful educational system, which emphasizes equity, cooperation, and interdisciplinary learning based on twenty-first-century skills(Braskén et al., 2020; Üstün & Eryilmaz, 2018). The Finnish curriculum's learning objectives are centred around competencies in thinking, learning-to-learn, cultural understanding, communication technology, and entrepreneurship to construct a sustainable future (FNBE, 2016).

The importance of integration among different subjects has been addressed in the Finnish national curriculum for several decades, but currently, the FNBE (2016) states that all schools must design and provide at least one "multidisciplinary learning module" per year for all students, focused on studying phenomena or topics that are of special interest to students. Moreover, students are expected to participate in the planning process of these studies, and the phenomena being studied should allow every student to work with questions that interest them (Braskén et al., 2020).

The incorporation of interdisciplinary methodologies in education in Finland was initiated in the 1960s with the introduction of the comprehensive school system (CPI, 2019). Although the government had begun contemplating changes to the education system as early as 1945, it was not until the 1960s that the comprehensive school system was established. After WWII, Finland saw significant changes in its population and economy. The demand for high-quality education also increased, resulting in more students enrolling in grammar schools. However, there were inequalities as children from agricultural and working-class backgrounds attended grammar schools in low numbers. Similarly, there was a stark urban-rural divide. This led to the need for reforms to provide quality education for all children regardless of their socioeconomic background or where they lived (CPI, 2019). All of that resulted in the transformation of the Finnish education system gained recognition in the early 2000s when Finnish students began to score exceptionally well in international assessments such as the Programme for International Student Assessment (PISA; CPI,2019).

Additionally, in the interdisciplinary approaches that Finland implements in its curricula, it follows the methodology of Phenomenon-based learning (PhenoBL) which is a progressive approach to curriculum and pedagogy suitable for 21st Century learners. Despite its potential to enrich the learning experience, PhenoBL presents certain challenges that cannot be overlooked. In this regard, Lähdemäki (2018) has pointed out that both educators and learners face difficulties in the process of transitioning from the identification of a phenomenon to the development of an interdisciplinary unit of inquiry that is feasible to execute. The teacher's primary responsibility is to assist students in identifying a problem that is sufficiently complex to be explored from multiple disciplinary perspectives, while at the same time being manageable enough to be tackled comprehensively. When implementing a PhenoBL approach in the classroom, both students and teachers must decide on a phenomenon for analysis through mutual agreement. Sam Tissington (2019) advocates the use of current events and local issues as springboards for this process. Jenna Lähdemäki (2018), in a similar vein, suggests allowing students in Year 8 to select a phenomenon related to Europe. In this example, the students chose Auschwitz, Food Culture in Germany, and European Art as their phenomena. Once a phenomenon has been identified, educators must use problem-based and inquiry-based pedagogies to conduct their investigations (Halinen, 2018; Lähdemäki, 2018). Problem-based learning involves posing a problem to the class that can be solved through active learning, while inquiry-based learning requires the use of systematic methods to address a problem. In my teaching experience, I see these approaches as complementary ways of guiding students through the process of identifying a phenomenon, defining a problem, and conducting an investigation. In a PhenoBL approach, teachers may need to structure lessons that require students to explore multiple subject areas. Symeonidis and Schwartz (2016) suggest that it may be beneficial for

educators with different subject-specific expertise to collaborate, thereby promoting a cross-curricular focus during investigations.

**One way that it was implemented was the following:**

PhenoBL is an innovative instructional approach that has been implemented in Finland's education system. This approach emphasizes inquiry-based learning and holistic understanding, and it is rooted in the 2016 national curriculum reform. The primary objective of PhenoBL is to engage students in real-world phenomena exploration, thereby fostering critical thinking, creativity, teamwork, and communication skills. PhenoBL revolves around the natural curiosity of students, and it allows them to investigate and solve problems related to interdisciplinary issues. For instance, The English School in Helsinki organized a phenomenon-learning week on "time," where students from various grades approached the concept from diverse angles. They created projects guided by their inquiries, which exemplified the PhenoBL approach. Inquiry-driven and sustained by 21st-century skills, PhenoBL encourages students to pose essential questions, conduct research, and explore multiple perspectives on a phenomenon. The process goes beyond memorizing facts; it involves evaluating sources, interpreting information, and using evidence to develop new understandings. The resulting projects, ranging from digital posters to 3D models, serve as a culmination of students' learning and a means to share their newfound knowledge with an audience. PhenoBL not only benefits students but also promotes teacher collaboration and interdisciplinary projects, such as combining art and physics or biology and cooking. The approach also allows students to explore and create using high-tech tools like virtual reality and 3D design programs. Furthermore, PhenoBL instils a sense of advocacy in students. For instance, a seventh-grade class researching water usage in their community presented data through graphs, utilized LEGO robots to address water-related challenges, and proposed solutions. The project empowers students to take action based on their discoveries. In essence, PhenoBL's success lies in engaging students in the process of inquiry, fostering curiosity, and challenging them to pursue their dreams. By intertwining real-world phenomena with education, Finland's instructional model encourages students to go beyond traditional learning and illuminate what they once considered mysteries.

PhenoBL and Interdisciplinarity are innovative pedagogical approaches that encourage learners and educators to surpass the constraints of traditional subject teaching and delve into interdisciplinary explorations and diverse phenomena. In Finland, one of the major strategies to implement Interdisciplinarity in the curriculum was to provide all students with an opportunity to explore issues that genuinely interested them (Braskén et al., 2020). By doing so, students were empowered to take charge of their learning, develop an inquisitive mindset, and enhance their critical thinking skills through inquiry-based learning. This approach is particularly beneficial for businesses and academic settings as it fosters creativity, collaboration, and problem-solving skills, which are essential for success in the 21st century.



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