



D5.4 – Final Report on Network of Stakeholders and Dissemination activities

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Executive Summary

In this document, we provide an update on the related activities of the consortium for the period starting from the beginning of the third year of the project, up till the end of the project's core activities. As stated in the DoW, WP5 receives input from all other work packages in as much as its task was to constantly and consistently disseminate the project results. Additionally, WP5 supports all the other work packages, by maintaining the website for sharing the project results, coordinating the social networking activities, providing outreach materials, promoting public inclusion activities (games/visualization) and organizing events.

Within this timeframe, the consortium has focused its efforts to disseminating the progress and the results that were gradually being produced by the activities of the project, in a more systematic manner. This activity has led to a number of activities taking place, across various channels and communities. During this time, GAIA managed to further grow its audience across a set of online social platforms, as well as participate at a number of high-profile science and research-oriented public events. In this document, we present an overview of all of these aspects.

Moreover, the consortium has produced sets of dissemination and educational material, which is meant to both help communicate the practical results of the project, as well as help in continuing the project activities and keep alive for the near future the school community brought together by the project. We present such aspects in this document, and also discuss the future directions of the dissemination activities of the consortium, after the project officially ends.

1. Introduction

During the third year of the project and up to May 2019, building on the previous achievements of the project realized within its first two years and the momentum achieved, the consortium has applied a dissemination strategy to continue maximizing the impact of the project, along the following dimensions:

- *Expanding the broad community* of students, teachers and citizens around the GAIA applications, by augmenting and reinforcing the existing communities within the pilot schools.
- *Continuing the outreach activities* targeting the educational community through the network of affiliated schools and via the use of social media.
- *Promoting the use of the GAIA IT service ecosystem facility* by promoting it in the European context and beyond as a best practice example for user-centric design by creating ICT services facilitating efficient energy management.
- *Targeting dissemination efforts of the GAIA facility* toward specific stakeholder groups: citizens, local government, SMEs, and the research community.
- *Expanding our strategy* for assuring the sustained availability of GAIA platform and its results after the end of the project.

Dissemination and exploitation are indispensable to adding value to the project and strengthening its impact. Systematic efforts are also being made to add continuity to GAIA after its lifespan. In particular, the dissemination plan has established rules and guidelines on how GAIA shares outcomes with stakeholders, relevant institutions and organizations. The aim of GAIA in this period, as well as during the period following the completion of the project, is to put special emphasis on the dissemination of tangible results, targeting the interested audience, selecting the results and dissemination channels based on the audience interests. The GAIA consortium has been actively communicating the project's activities and will share results with the broader, non-specialized audience, to achieve a wider citizens' awareness.

All members of the consortium are participating in dissemination activities, with the members linked more closely to the pilot sites have been acting as the primary dissemination managers in their respective communities. Such activities required competences in public press releases, graphic and web design, along with the management and execution of these dissemination activities in the pilot sites located in Greece, Italy, and Sweden, and the contributions to the overall educational community dissemination plan established in WP5.

In this deliverable, we report on the status of WP5 for the period following the second year up to the end of the project:

- Chapter 2 goes into more detail in terms of the project's strategy and goals during the respective reporting period for this document (February 2018 – May 2019).
- Chapters 3 report on the updated dissemination material produced during this period and the production of new video material for the project.
- Chapter 4 discusses the dissemination aspects related to GAIA's website.
- Chapters 5, 6 and 7 discuss dissemination activities in social media, academia, research and educational communities.

- Chapter 8 provides a brief discussion on all of the consortium partners' activities, as well as a quantitative overview of the achievements of the project in terms of dissemination.
- Chapter 9 provides a summary of the educational material produced for the project aimed to be disseminated to the educational community in the form of the two GAIA booklets.
- Chapter 10 provides a summary of the planned dissemination activities scheduled to take place during the months following the project's completion.
- Chapter 11 concludes this document.

2. Dissemination Goals and Achievements

In this section, we present the goals established during the first two years of the project with respect to dissemination of GAIA, in terms of the targeted audience. The dissemination strategy of the project was designed to maximize its impact along the following dimensions:

- Create a broad community of students, teachers and citizens around the GAIA project ecosystem by augmenting the existing communities within the pilot schools.
- Maximize the outreach activities targeting the educational community through the network of affiliated schools and via social media.
- Stimulate the use of the GAIA IT service ecosystem by promoting it in a European context and beyond, as a best practice example through the provision of ICT services facilitating efficient energy management.
- Target dissemination efforts of the GAIA facility toward specific stakeholder groups: citizens, local government, SMEs and the research community.
- Apply a focused strategy for maximizing the sustained availability of GAIA platform.

The table below briefly illustrates the dissemination goals for engaging with each of the different major stakeholders of GAIA.

Targeted stakeholders	Dissemination goals
Students	<ul style="list-style-type: none"> - Raise awareness regarding the benefits of using GAIA applications. - Understand the socio-economic impact of user activities relating to energy efficiency and savings. - Encourage students to participate in GAIA workshops and school competitions as well as share this information with their friends and family. - Embolden students to participate and provide feedback on their behavior that affects energy consumption. - Maximize the effectiveness, usability and applicability of the proposed technological solutions through direct user feedback and early validation.
Teachers	<ul style="list-style-type: none"> - Raise awareness regarding the benefits of using GAIA applications & services. - Understand the socio-economic impact of user activities relating to energy efficiency and savings. - Encourage teachers to participate in GAIA workshops and school competitions as well as share this information. - Support teachers with documentation and guidelines to teach energy awareness through GAIA in their respective lesson plans (science, physics, ecology, economics, etc.).

Staff Building Admins &	<ul style="list-style-type: none"> - Raise awareness regarding the benefits of using GAIA applications & services. - Understand the socio-economic impact of user activities relating to energy efficiency and savings in the context of school buildings. - Encourage users to participate in GAIA activities and follow recommendations and guidelines. - Maximize the effectiveness, usability and applicability of the proposed technological solutions through direct user feedback and early validation.
Parents	<ul style="list-style-type: none"> - Raise awareness regarding the benefits of using GAIA applications & services. - Understand the socio-economic impact of user activities relating to energy efficiency and savings. - Encourage parents to participate in GAIA activities together with their children. - Strengthen and galvanize public support for efficient energy use.

Dissemination Activities Overview

The use of the following dissemination instruments has been used:

- *Project brochures and posters*: they provide an overview of the objectives, approach, consortium and targeted results with emphasis placed on the scale of breakthroughs and innovations that have been achieved and are expected.
- *The project website*: it provides a project description, project vision and objectives, the relationship between the project, the goals of the Horizon 2020 framework, and the composition of the consortium with partner profiles and their respective areas of expertise. The site will continue to be regularly updated by consortium members over the lifetime of the project with relevant publications and public materials that highlights all relevant progress in the project's implementation.
- *Press releases and press notes*: have been, will continue to be provided for use in public newspapers/agencies, and specialized journals as well as highlight press coverage the project has received.
- *Workshops*: Have been and will continue to be arranged with schools and universities in cooperation with stakeholder associations.
- *Presentations*: Have taken place at meetings and workshops organized by the European Commission/EASME, IoT Forum, Energy Efficiency Initiatives, Sustainable Energy Week, etc.
- *Social networks*: The project will maintain and enhance its presence on social media such as ResearchGate, LinkedIn (SlideShare), Facebook and Twitter, amongst others. The first two, for example, will be used for interaction with a more professional community (researchers, SMEs, large industry), while the latter two mentioned above are used for directly interacting with the general public.
- *Network of Stakeholders*: The project disseminated its activities and results in a network of stakeholders. We have initiated activities in this field by establishing connections with the

Scientix¹ network and by contacting directly with other school networks in Austria, Italy and Malta, which have expressed interest with respect to the work conducted in the project.

- Organization of activities focused towards the research community: The consortium has co-organized 4 research-oriented events in the third year of the project, namely a workshop in PerCom 2018 (March 2018), a summer course (within the Play-Create-Learn workshop, July 2018), a workshop in Aml 2018 (November 2018), as well as a joint workshop with sister projects of GAIA (November 2018).

The communication activities within GAIA have been undertaken in order to raise awareness regarding our shared responsibility for the environment as a society and as individuals, through the project's results and tangible benefits for the environment. The consortium's dissemination activities will continue for several months after the end of the project, focusing on results and targeting local markets/communities. During the final 16 months of the project, GAIA organized, co-organized or participated in public events in Greece, Austria, Germany, Italy and Sweden, where demonstrations of the GAIA benefits and presentations of the success stories took place. Moreover, these communication activities have focused on promoting the GAIA platform the same way a company advertises their products and services, in a multi-language approach.

Additional Communication Activities

There have been other communications that are not specifically covered above, which include outreach material, more in-depth information regarding the website and social network developments will be covered in latter sections. A brief overview regarding their status is shared in the following sections.

Outreach Material

Outreach material has already been created in the first two years of the project in several languages (in almost all cases in English, Italian, and Greek) for consortium members to print and share at workshops, meetings and conferences. They were updated and improved during this reporting period and are discussed later in this chapter. These include the following:

- *GAIA Videos* – A number of videos were created and published, primarily on YouTube, to showcase the course of the trials, GAIA's software and educational activities.
- *GAIA Posters* – The previous poster was updated with a new color scheme more in line with our visual identity, and a new poster was created.
- *GAIA Brochure* – Our brochure was updated with a new color scheme more in line with our visual identity, along with new content to reflect updates in our software lineup. It is available in English, Greek and Italian versions.

¹ The community for science education in Europe, www.scientix.eu/about

Website

The website has been up and running for over 2.5 years now, being continually updated throughout this period. More information about the website and related statistics are provided in chapter 4 of this document.

Social Networks

Here is a list of our nine currently active social media accounts with a short bit of information about each one. More information on these aspects is provided in Chapter 5 of this document.

- *Twitter* – Currently at 510 followers. CTI maintains.
- *Facebook* - Currently at 443 followers. CTI maintains.
- *YouTube* - We have 22 videos with over 1500 total views. CTI maintains, with several partners contributing.
- *Instagram* - Currently at 124 followers. CTI maintains.
- *ResearchGate* – Currently at 16 followers. CTI maintains.
- *SlideShare* - We have shared 11 presentations and have 14 followers. CTI maintains.
- *GitHub* – Currently at 12 repositories. CTI maintains.
- *Snapchat* - Account has accumulated 311 points through weekly posts. EDOC maintained the site until it left the GAIA consortium.
- *Reddit* – Currently 5 posts and 10 comments with 1 Karma. EDOC maintained the site until it left the GAIA consortium.

3. Communication Material – Year 3 and on

Over the course of the third year of the project and on, we have significantly expanded our outreach and communication activities following. In order to maintain the momentum reached during the first two years of the project, we have invested effort in order to update communication material, like the project brochures and the posters used in various dissemination events attended by members of the consortium. Both of these are intended to explain the fundamental aspect of the project to a diverse group of potential stakeholders as well as the public.

In addition, a large number of videos have been produced by the members of the consortium, in order to display the software ecosystem of the project, the educational output, as well as share our public dissemination activities and promote the project to a broader public.

OVOS, together with EA, have created a set of visual assets to be used across the project, in order to have a consistent visual identity across all the different types of dissemination activities of the project. Such assets included:

- Graphical templates, with the respective guidelines on their use.
- A series of graphical illustrations used for assets like the project brochure and posters.
- Animation templates to be used while producing video material for the project.
- Graphical assets for the online and mobile software components of the project.

More importantly, this kind of visual identity is utilized also the educational material produced at the end of the project, in the form of the two GAIA booklets discussed later in this document. Since these booklets will be disseminated to the educational community at the end of the project and further on, they will also serve as general dissemination material for the project. In this sense, we have tried to have a relatively consistent across the dissemination and the educational material of the project, since those two by the end of the project are directly related.

Brochures

The initial version of the project brochure was created early in year one of the project (Reported in D5.2) and has been translated to Italian and Greek during year two. It was updated to feature new results and updates to the status of the project during the third year of the project. Below (Figures 1 & 2) is the version of the Greek version of the brochure. Over 600 brochures for this version have been printed and utilized during the various science exhibitions attended by the members of the consortium.

Πιλοτικό πρόγραμμα

Έναρξη: Οκτώβριος 2017
Λήξη: Ιούνιος 2019

GAIA πιλοτικά σχολεία:

- ⇒ 25 σχολεία στην Ελλάδα
- ⇒ 1 σχολείο στην Ιταλία
- ⇒ 1 Πανεπιστήμιο στην Ιταλία
- ⇒ 1 σχολείο στη Σουηδία

Διαγωνισμοί:

- ⇒ Εθνικοί διαγωνισμοί
- ⇒ Πανερωπαϊκοί διαγωνισμοί

GAIA Υλικό

Εκπαιδευτικό Υλικό:

- ⇒ Εκπαιδευτικά σεσάρια
- ⇒ Εργαστηριακές ασκήσεις (GAIA Lab kit)

Εφαρμογές:

- ⇒ GAIA Challenge
- ⇒ Εφαρμογή Σχολικού Διαχειριστή
- ⇒ GAIA Companion

GAIA ιστοσελίδα: <http://gaia-project.eu/>



<https://www.facebook.com/EUGAIAProject/>



https://twitter.com/eu_gaia



<http://bit.ly/2yqIEom>



https://www.instagram.com/eu_gaia_project



https://www.slideshare.net/GAIA_Project



gaia_project

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Green Awareness In Action



EE-11-2015 "New ICT-based solutions for energy efficiency"

Το έγγραφο αυτό αντικατοπτρίζει μόνο την άποψη των συγγραφέων και η ΕΕ και η EASME δεν είναι υπεύθυνες για οποιαδήποτε χρήση των πληροφοριών που περιέχει.



GAIA Challenge



Η Πρόκληση GAIA με παιγνιώδη τρόπο ευαισθητοποιεί και διατρεί το ενδιαφέρον των μαθητών σε μακροπρόθεσμες εκπαιδευτικές δραστηριότητες, μέσα από

- ⇒ Αποστολές γνώσης
- ⇒ Αποστολές δράσης

<http://gaia-challenge.com>

Εργαστηριακές Ασκήσεις



Επίπεδο γνώσεων

Οι μαθητές θα είναι σε θέση να αναγνωρίζουν έναν υπολογιστή Raspberry Pi, ηλεκτρονικά εξαρτήματα και αισθητήρες και να περιγράφουν τον τρόπο που αυτά λειτουργούν.

Επίπεδο ικανοτήτων

Οι μαθητές θα μπορούν να κατασκευάζουν κυκλώματα χρησιμοποιώντας το υλικό (hardware) του εργαστηρίου.

Εκπαιδευτικές Δραστηριότητες

Οι εκπαιδευτικές δραστηριότητες καλύπτουν μία ή περισσότερες από τις ακόλουθες πτυχές βελτίωσης της ενεργειακής απόδοσης στο σχολικό κτίριο, ανάλογα με τις τοπικές συνθήκες και το εκάστοτε εκπαιδευτικό ενδιαφέρον:

- ⇒ Χρήση Φωτισμού
- ⇒ Χρήση Ηλεκτρονικού εξοπλισμού
- ⇒ Χρήση Θέρμανσης/Ψύξης
- ⇒ Χαρακτηριστικά του κτιρίου

GAIA Companion

Gaia Companion : Μια εφαρμογή για συσκευές Android που μπορούν να χρησιμοποιήσουν οι μαθητές και οι καθηγητές για να παρακολουθούν σε σχεδόν πραγματικό χρόνο την κατάσταση που



Εφαρμογή Σχολικού Διαχειριστή



Εφαρμογή GAIA: Παρέχει στους μαθητές και στους εκπαιδευτικούς πρόσβαση σε δεδομένα που συλλέγονται μέσω διαφόρων μετρητών και αισθητήρων για την παρακολούθηση της κατανάλωσης ενέργειας και των περιβαλλοντικών συνθηκών στο σχολικό κτίριο

<http://bms.gaia-project.eu>

Figure 1 Front and back view of the updated GAIA brochure (Greek version)

Posters

In addition, a poster was created early during year one of the project (Reported in D5.2), like the brochure and was improved during the second year (Figure 3). An additional poster was created for explaining the Serious Educational Game, GAIA Challenge (Figure 4).

GREEN AWARENESS IN ACTION **GAIA**

GAIA CHALLENGE PILLARS

The three pillars of the GAIA challenge

- Knowledge**: Test your knowledge in the interactive Quest Map. Many tasks of various subject areas await you.
- Action**: Document your team's activities to reduce the school's energy consumption and share your findings as snapshots or portfolios.
- Community**: Work together in mission teams and compare your results with other schools.

GAIA EDUCATIONAL LAB KIT

- OPEN SOURCE HARDWARE & SOFTWARE
- SET OF EDUCATIONAL LAB ACTIVITIES
- STEAM LEARNING TOOL
- INCREASE ENERGY AND SUSTAINABILITY AWARENESS

GAIA COMPANION APP

- ANDROID APP
- MONITOR IoT DATA IN REAL-TIME
- USE DURING EDUCATIONAL ACTIVITIES
- AVAILABLE IN ENGLISH, GREEK, ITALIAN

Partners: CTF, SÜDERHAMN!, onit, SYNELIXIS, OVER, spark works, OVOS, European Union (Horizon 2020 European Union funding for Research & Innovation)

Figure 2 The additional GAIA poster

Videos

Several videos were created over the course of the second year via our YouTube channel, with 22 videos made public as of May 15, 2019. These include the first introductory videos of our prototype applications from WP3, which were then followed upon by introductory videos for the completed applications. In addition, 2 videos related to activities undertaken with students during the 2018-19 school year were produced and published. We expect that in the coming months, students together with teachers will produce additional videos to showcase their activities within the project. Moreover, the visual part of the channel has been updated to be more consistent with the overall visual identity of the project.

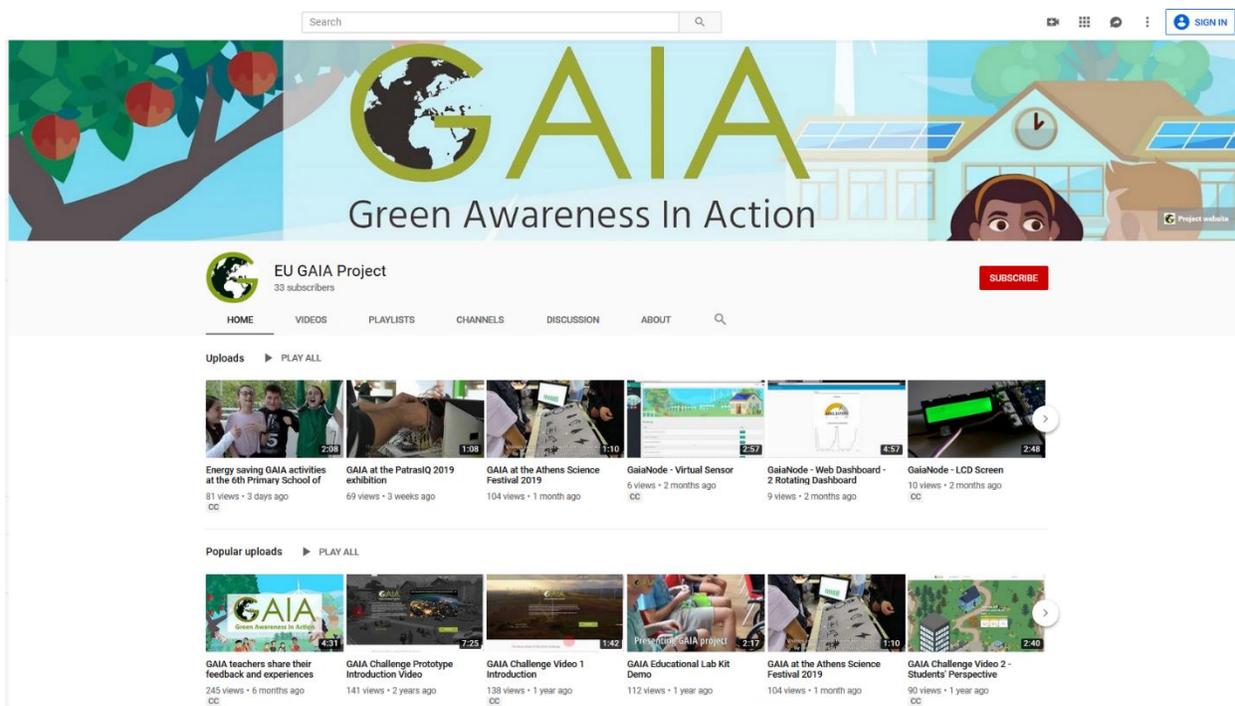


Figure 3 The current homepage of GAIA’s YouTube channel

In the following table, we summarize the videos added on our YouTube channel during the period covered by this deliverable.

GAIA teachers share their feedback and experiences

In this video, teachers from GAIA schools share their feedback and experiences from the first round of trials for the project, during school year 2017-18. Educators from Italy, Greece and Sweden describe how the project has enabled them to make their lectures more engaging and what they have accomplished so far regarding sustainability and energy efficiency.

Produced by CTI, CNIT, SK, EA and OVOS.



GaiaNode - Web Dashboard - 1 Basics

Part of a video series introduction to GAIA’s Node-RED software. We showcase here the creation of a web dashboard with GAIA readings, e.g., displayed on a tablet/screen in the hall of the school.

Produced by CNIT.

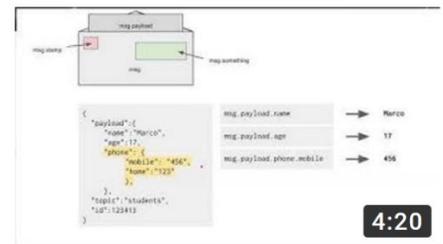


6:07

GaiaNode - Node-Red basics

Part of a video series introduction to GAIA’s Node-RED software. The goal here was to highlight the basics of the Node-RED tool: understand the message flow, be able to deploy a simple flow and use the debug panel.

Produced by CNIT.

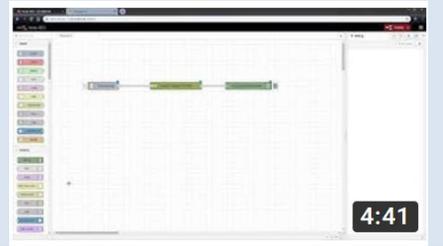


4:20

GaiaNode - Read a sensor

Part of a video series introduction to GAIA’s Node-RED software. The goal here was to create a flow to retrieve the latest value read by a GAIA sensor, given the resource ID, and display it in the debug panel.

Produced by CNIT.

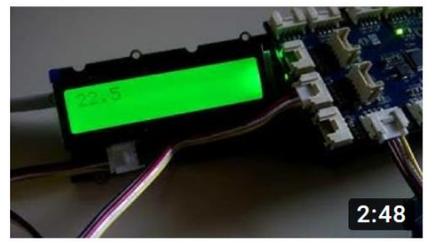


4:41

GaiaNode - LCD Screen

Part of a video series introduction to GAIA’s Node-RED software. The goal here was to showcase how to read a value from a sensor and/or from the platform and display it on a connected LCD screen.

Produced by CNIT.



2:48

GaiaNode - Web Dashboard - 2 Rotating Dashboard

Part of a video series introduction to GAIA’s Node-RED software. We showcase here how to create a web dashboard e.g., displayed on a tabled/screen in the hall of the school.

Produced by CNIT.



4:57

GaiaNode - Virtual Sensor

Part of a video series introduction to GAIA’s Node-RED software. We explain how to create a virtual sensor using the GAIA BMS and send new measurements using Node-Red.

Produced by CNIT.



2:57

GAIA at the Athens Science Festival 2019

The GAIA team participated at the Athens Science Festival 2019 last week with an interactive installation made using conductive ink, Arduinos and Raspberry Pis.

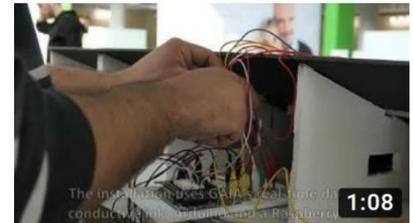
Produced by CTI.



GAIA at the PatrasIQ 2019 exhibition

The GAIA team participated at the Patras Innovation Quest Technology Transfer Exhibition (PatrasIQ), held between April 12-14 in Patras, Greece, one of the major events of its kind in Greece. We showcased an interactive installation made using conductive ink, Arduinos and Raspberry Pi, meant to serve as an example for a GAIA-enabled control panel inside a school.

Produced by CTI.



Energy saving GAIA activities at the 6th Primary School of Kaisariani, Greece

The 6th Primary School of Kaisariani participates in the GAIA project. In this video, the students of the school are presenting their work towards a more energy-efficient school!

Produced by the students and the teachers of the school, and reviewed by CTI.



Interview to the principal of the Gramsci Keynes School in Prato

The students of the IV CLS of the Gramsci Keynes School interviewed the school's principal to discuss concrete actions for energy saving. Produced by the Gramsci Keynes School in Prato.



The GAIA Challenge explained

The GAIA Challenge is the online playful part of GAIA, which helps to introduce students to concepts related to sustainability and energy savings. It is designed for students between 10-17 years old, containing many "quests" towards learning more things as you progress through the Challenge.

Produced by OVOS.



4. Public Project Website

GAIA's website was created during the first year of the project and was documented in D5.2. It is publicly available at <http://gaia-project.eu/>.

Regarding project website statistics, the following table gives an overview of the total number of views and visitors throughout the past 15 months. A total of around 21.100 views have been recorded to GAIA's website. In general, the website has been visited frequently by a significant number of visitors, with the overall activity staying in similar levels as the previous school year. We expect that traffic in our website will continue to remain substantial throughout the following months. Although the bulk of the interaction of the educational community with the project was done through the GAIA Challenge and social networking channels, our website has also played a significant role in keeping the GAIA community up to date, as well as disseminating information about the project to the research and overall educational communities in Europe and at a global level.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2016										164	482	284
2017	336	339	393	623	984	1.2K	531	823	1.0K	923	957	674
2018	547	650	797	888	626	1.0K	332	308	554	688	598	474
2019	849	1.1K	753	552	621							

Figure 4 Views per month for the project website (gaia-project.eu)

Overall, it seems that there is a steady flow of visits to the website, with certain peaks appearing especially in cases of significant announcements, like the 2 contests held in 2018 and 2019 and the respective results' announcement. In terms of referrers, apart from search engines, the top referrer to the website is Facebook, justifying its use as a central dissemination gateway used by the consortium.

A second table shows the origin of the visitors of the website, for the 20 most popular countries visiting the website. As is evident, the countries participating in the project (Greece, Italy and Sweden) are the 3 most popular ones. Although the percentage of Sweden appears low at a first glance, it seems that there are some inconsistencies in reporting the actual location of the visitors, due to the use of VPN technologies. Other than that, there is a significant number of views from the United States, probably reflecting interest from the research community, as well as a number of other EU countries, such as Belgium, Cyprus and Spain. This activity to a certain extent reflects the ties between the educational communities in Europe, e.g., between Greece and Cyprus, or Austria and Germany. It also reflects that the dissemination strategy of the project worked in terms of raising awareness about the project in the international research and educational community.

Overall, we have recorded visits from 60 countries, with more than 10 visits per country, from all around the world. As seen in the following figures, there are visits from literally every part of the world to the website.

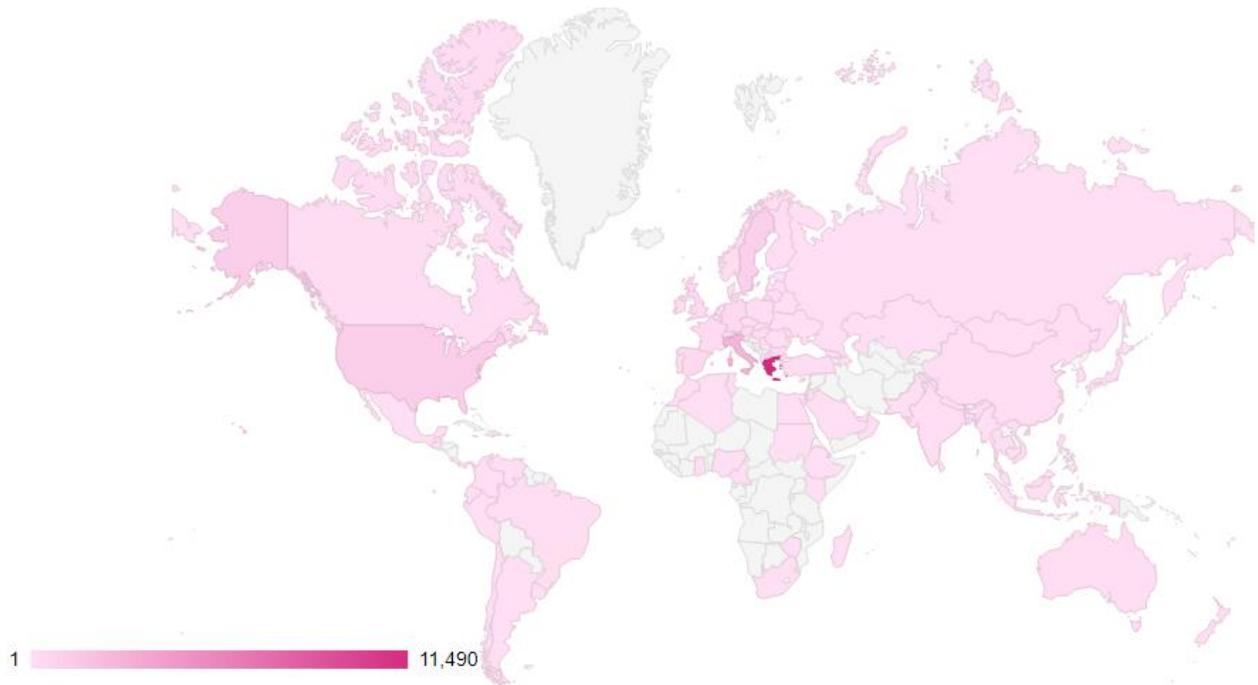


Figure 5 Geographical distribution of visitors of the project website

Table 1 Views per country for the project website for the duration of the project (20 most popular)

Country	Visitors
Greece	11490
Italy	2603
United States	1025
Sweden	962
Belgium	528
Spain	397
Germany	395
United Kingdom	329
Austria	303
Cyprus	261
France	226
European Union	217
Netherlands	166
Canada	151
Hungary	147
Poland	138
Portugal	137
Switzerland	117
India	106
Turkey	104

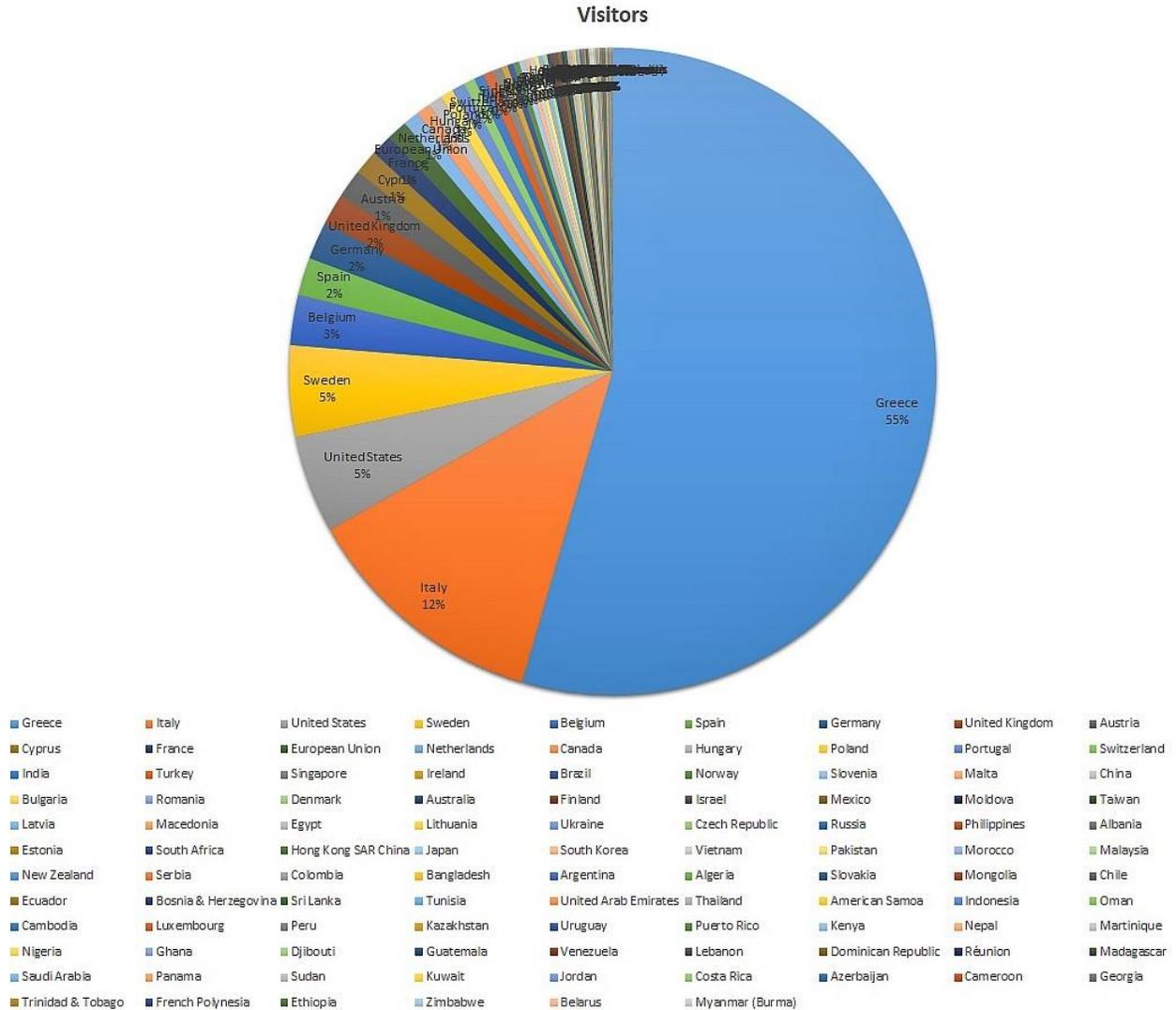


Figure 6 Views per country, as percentage of views from all countries

5. Activity in Social Networks – Year 3 and on

The project has maintained a strong presence on social media such as Facebook and Twitter, with a good degree of success, especially within the context of a research project. Such activities have been used for networking with the research and scientific community, as well as for directly interacting with the trial activities' participants and the general public, by providing updates about the progress of the project and other kind of information related to the project, e.g., announcement of the GAIA contests, or workshops organized by the consortium. The following table highlights the social media activities and progress, where applicable, since D5.3 was submitted at the end of the second year.

Table 2 Statistics for the social networking presence of GAIA

Social Network	End of Year 2	May 2019	Change
Twitter	292 followers 170 tweets	510 followers 256 tweets	+218 followers +86 tweets
Facebook	238 followers 78 posts	443 followers 160 posts	+205 followers +82 posts
YouTube	17 subscribers 650 views	33 subscribers 1510 views	+16 subscribers +860 views
Instagram	40 followers 16 posts	124 followers 48 posts	+84 followers +32 posts
SlideShare	5 presentations 12 followers	11 presentations 14 followers	+6 presentations +2 followers
ResearchGate	12 collaborators 16 followers 93 reads	12 collaborators 19 followers	No change +14 followers +88 reads
GitHub	8 repositories	12 repositories	+4 repositories
Snapchat	311 points	311 points	No change (was originally maintained by EDOC and is not being updated)
Reddit	5 posts 10 comments	5 posts 10 comments	No change (was originally maintained by EDOC and is not being updated)

As a side note, there is additional material related to the project that is produced by schools participating in the project, or consortium partners, which is made available through their respective YouTube channels, such as the following:

- A video made by the Gramsci Keynes school for the GAIA contest of 2018, with a total of 6085 views as of May 15, 2019, available online <https://www.youtube.com/watch?v=eWWkP8ladSM>
- Videos related to GAIA on the YouTube channel of Synelixis Solutions, as part of a series of GAIA BMA tutorials, which have an additional 442 views in total (link to the respective playlist https://www.youtube.com/watch?v=liN2nITSpGw&list=PLUMQocOUND_4rL1wga9q7wj69Am6_1KePv).

Adding these views to the YouTube views on our official channel, it **brings the total number of GAIA-related YouTube video views above 8000**. A brief overview of how we utilized the respective social networks and links for accessing them follows.

	Twitter	https://twitter.com/eu_gaia
<p>The consortium has an account on Twitter (@eu_gaia). This account is meant to provide information regarding the progress of the project in a more frequent manner, e.g., by reposting updates in the website, pieces of information related to GAIA, or events happening organized by the consortium, among a number of potential subjects. Additionally, our Twitter account also actively promotes topics of general interest relating to issues that are related to our goals and those of accounts promoting the work by our fellow H2020 EE projects. This has helped us in gaining a respectable number of followers, as well as promote a sense of community around the common causes of energy efficiency, behavioral change and gamification. The GAIA Twitter account is administered by CTI, who is responsible for posting and updating this communication channel.</p>		
	Facebook	https://www.facebook.com/EUGAIAProject
<p>Another key social network is Facebook. Our account can be found at @EUGAIAProject. This account plays an important role, as progress with our trials and have the opportunity of reaching out directly to and for the trial participants. The focus of our Facebook page has been not only to communicate information relating to our project, but also to share the experiences, activities and outputs of our trial participants, with the hope that they will share this content amongst their friends in Facebook to widen our reach.</p>		
	SlideShare	http://www.slideshare.net/GAIA_Project
<p>We have been using LinkedIn to develop additional professional-focused contacts. We have set up a SlideShare account, through LinkedIn, where we have uploaded a set of presentations/PowerPoints that we think may be useful and interesting for public consumption.</p>		
	Instagram	https://www.instagram.com/eu_gaia_project/
<p>Our Instagram account is currently up and running sharing #ScavengerHunt game items and project info. Content will be enhanced with Snapshots from the GAIA Challenge, Lab Kit activities and instances from participation in public events, like science exhibitions. CTI maintains this account.</p>		

	YouTube	https://www.youtube.com/channel/UC6BA2B6FMNE83-UFZw34gZA
<p>YouTube is an important outlet for the project where we have shared many videos highlighting some of our activities, as well as for sharing prototypes and demos of our product.</p>		
	ResearchGate	https://www.researchgate.net/project/GAIA-Green-Awareness-In-Action-2
<p>A project page is set up in to make it easier for researchers using the platform to track the progress of the project and have access to things like publications and associated research activities</p>		
	GitHub	https://github.com/GAIA-project
<p>A GitHub account was setup during year one on GitHub. We have seen much more activity here due to the outcomes of WP2 and WP3 activities. This will continue to be the place where our open source code, manuals and wikis are located.</p>		
	Reddit	https://www.reddit.com/user/EU_GAIA/
<p>A Reddit account was set up under the r/Energy_Efficiency Subreddit, in order to share our activities more widely. This account has been inactive since EDOC's departure from the consortium.</p>		
	Snapchat	gaia_project
<p>A Snapchat account was made, with the username gaia_project. It provided an additional means for making our project known to a wider audience. It active during the trials period for school year 2017-2018. This account has been inactive since EDOC's departure from the consortium.</p>		

6. Dissemination in Academia and Research Communities

In this section, we cover the activities of the consortium members related to the academic and research community. We first list the academic publications made by the consortium members, then present the workshops co-organized by the GAIA consortium, followed by the research exhibitions in which GAIA aspects were showcased.

Scientific Publications

The consortium has been continuously dedicating considerable effort towards communicating its results to the research community. This activity has paid off quite nicely, since several publications directly related to GAIA have been accepted, while there is there also a number of submissions under review at the time of writing this report. Furthermore, the consortium is considering submitting additional articles in the coming months, after the completion of the project. The following table contains the publications authored by the consortium, which are directly related to the project, which were made during 2018 and 2019.

Journals
<ol style="list-style-type: none"> 1. G. Mylonas, C. Triantafyllis, D. Amaxilatis, "An Augmented Reality Prototype for supporting IoT-based Educational Activities for Energy-efficient School Buildings". In <i>Electronic Notes in Theoretical Computer Science</i> 343C (2019), pp. 89-101, Elsevier. 2. E. Μαυρομάτη, Χ. Τζιωρτζιώτη, Γ. Μυλωνάς, Ι. Χατζηγιαννάκης, "Σενάρια για εκπαιδευτικές δραστηριότητες που χρησιμοποιούν δεδομένα από το Διαδίκτυο των Αντικειμένων". <i>Journal, Περιοδικό «ΑΝΟΙΚΤΗ ΕΚΠΑΙΔΕΥΣΗ – το περιοδικό για την ανοικτή και εξ αποστάσεως εκπαίδευση και την εκπαιδευτική τεχνολογία», 2018.</i> 3. G. Mylonas et al, "An Educational IoT Lab Kit and Tools for Energy Awareness in European schools". <i>Journal, in International Journal of Child-Computer Interaction, Elsevier, https://www.sciencedirect.com/science/article/pii/S2212868918301004</i> 4. G. Mylonas, I. Chatzigiannakis, D. Amaxilatis, F. Paganelli, A. Anagnostopoulos, "Enabling Energy Efficiency in Schools based on IoT and Real-World Data". <i>Journal, IEEE Pervasive Computing, Volume: 17, Issue: 4, Oct.-Dec. 1 2018.</i> 5. G. Cuffaro, F. Paganelli, G. Mylonas, "A Web Resource-based Rule Management Framework for the Internet of Things". <i>Journal, Elsevier, Journal of Network and Computer Applications. Under review, submitted April 2019.</i>
Conferences
<ol style="list-style-type: none"> 1. C. Tziortzioti, I. Mavrommati, G. Mylonas, A. Vitaletti, I. Chatzigiannakis, "Scenarios for Educational and Game Activities using Internet of Things Data". <i>IEEE Conference on Computational Intelligence and Games (CIG18), Maastricht, Netherlands.</i> 2. Georgios Mylonas, Dimitrios Amaxilatis, Lidia Pocero, Iraklis Markelis, Joerg Hofstaetter, and Pavlos Koulouris. "Using an Educational IoT Lab Kit and Gamification for Energy Awareness in European Schools". <i>Conference, in Proceedings of the Conference on Creativity and Making in Education (FabLearn Europe'18). ACM, New York, NY, USA, 30-36. https://doi.org/10.1145/3213818.3213823.</i>

3. Γ. Μυλωνάς, Χ. Τζιορτζιώτη, Ε. Μπουφαρδέα, Η. Μαρκέλης, Π. Κουλούρης, “Ευαισθητοποιώντας την Ελληνική Σχολική Κοινότητα σε Θέματα Εξοικονόμησης Ενέργειας”. 5ο Πανελλήνιο Εκπαιδευτικό Συνέδριο Κεντρικής Μακεδονίας με θέμα: «Αξιοποίηση των Τεχνολογιών της Πληροφορίας και των Επικοινωνιών στη Διδακτική Πράξη», Θεσσαλονίκη, 2018
4. Na Zhu, Aris Anagnostopoulos, Ioannis Chatzigiannakis, “On Mining IoT Data for Evaluating the Operation of Public Educational Buildings”. Proc. Of IEEE International Conference on Pervasive Computing and Communications Workshops, 2018.
5. G. Mylonas, D. Amaxilatis, L. Pocero, S. Tsampas, J. Gunneriusson, “A Methodology for Saving Energy in Educational Buildings Using an IoT Infrastructure”. Conference, Submitted to IISA 2019. Under review, submitted May 2019.

Scientific Workshops co-organized by the consortium

PerCom 2018 - Pervasive Sensing for Sustainable Smart Cities and Smart Buildings

Date and place	March 19-23, 2018, Athens, Greece
Number of participants	25
URL	https://sites.google.com/dis.uniroma1.it/perscb17

IEEE PerCom² (International Conference on Pervasive Computing and Communications) is one of the most prestigious conference in the area of Pervasive Computing. For the 2018 rendition of the conference, it will take place at Athens, Greece, March 19-23, 2018. The coordinator of GAIA (CTI), organized a workshop in the context of PerCom, that is closely related to the work conducted in GAIA, and that attracted the participation of researchers working in the field. Overall, it looked into ways to design, develop and evaluate systems where IoT devices operate in continuous interaction with their owners to identify energy inefficiencies in buildings and achieve energy gains based on intelligent management.

The aim of this workshop was to collect papers from academic and industrial players, reporting original, previously unpublished research, which addresses this field. It is evident that the creation of an innovative IT ecosystem involves significant developments in a broad range of topics, from foundational topics regarding the organization and analysis of information to papers presenting novel technological platforms for interconnecting smart sensors and intelligent devices to pilots reporting recent developments in real-world deployments. In addition, novel approaches combining advances in IoT, Fog and Cloud technologies, with techniques such as gamification to stimulate engagement and behavior change are also in the scope of this workshop. The workshop included the presentation of 9 papers, with 2 sister projects of GAIA represented (ChArGED and enCOMPASS), and 1 paper directly related to GAIA presented in collaboration with the Sapienza University of Rome.

² <http://www.percom.org/>



Figure 7 A presentation during the PerSCB workshop

Ami 2018 – Behavioral Change and Ambient Intelligence for Sustainability

Date and place	November 12, 2018, Larnaca, Cyprus
Number of participants	25
URL	https://sites.google.com/diag.uniroma1.it/brains18/

The BRAINS (Behavioral Change and Ambient Intelligence for Sustainability) workshop was held in the context of the AmI 2018 (European Conference on Ambient Intelligence) conference in November 2018 in Larnaca, Cyprus. In this workshop, we looked into how to design, develop and evaluate systems that enable behavior capture and support behavior modeling so as to drive behavioral change using Ambient Intelligence. Certain challenges need to be overcome such as choosing the timing, modality, content, and the feedback systems of persuasive intervention strategies as well as the timing and modality of the systems that monitor the behavior. Therefore, the multi-disciplinary nature of designing and implementing behavioral change strategies and systems were within the core of this workshop.

The aim of this workshop was to attract papers reporting original, previously unpublished research, which addresses this important field. In addition, novel approaches combining advances in IoT, Fog and Cloud technologies, with techniques such as gamification to stimulate engagement and behavior change are also within the scope of this workshop. The workshop has been a success and will be most likely held again during the AmI 2019 conference, in November 2019.



Figure 8 Photos from the BRAINS workshop

Participation in Research Exhibitions

In this section, we briefly present the consortium members’ participation at several research exhibitions held in Europe during 2018 and 2019. The aim here was to disseminate the overall progress and results of the project to both the research/academic community and the broad public. We have opted to participate in events that attract several thousands of visitors each, in order to make an effective push to promote GAIA. This push has helped us to establish links to school and educational groups that are interested to participate in future activities related to the project, and to research teams and projects that would like to utilize the output of the project and its practical outcomes, such as datasets and educational material.

Athens Science Festival 2018

Date and place	April 27, 2018, Athens, Greece
Number of participants	Over 30000 visitors overall
URL	http://www.athens-science-festival.gr/

The 5th Athens Science Festival was held in Technopolis, City of Athens, between April 3 and 7, 2019. The Athens Science Festival is the largest exhibition on science and technology applications in education in Greece, with over 30,000 visitors in each event in recent years. GAIA, in collaboration with the 3rd High School of Nea Philadelphia presented an interactive version of the Educational Lab Kit, which was available for visitors to play with.

Figure 9 Athens Science Festival 2019



Figure 10 The GAIA team from the 3rd High School of Nea Philadelfia, supporting the GAIA booth

Researcher’s Night 2018, Athens

Date and place	September 28, 2018, Athens
Number of participants	Over 3000 visitors
URL	http://www.researchersnight.gr/

Researcher’s Night 2018 in Athens was held on the 28th of September 2018 at the Averoff Building, a historical building of the School of Engineering in Athens. This is a Europe-wide public event dedicated to popular science and fun learning, that takes place each year in September, with around 30 countries and over 300 cities involved. The Researchers’ Nights have been organized every September since 2005. The event presents science and researchers in different kinds of workshops, panel discussions and exhibitions. The event shows what researchers really do for society in interactive and engaging ways, promoting research careers to young people and their parents. This is the second time that GAIA project was presented at Researcher’s Night. This year, students and teachers from participating schools (1st Primary School of Psychiko and the 3rd High School of N. Philadelfia) were responsible to present the GAIA idea and explain the school activities that take place in their schools. Groups of students presented the GAIA sensor kit installed in their classrooms, the GAIA Challenge, the Building Manager Application and the GAIA lab kit activities. Below you can see photos from the Researcher’s Night event in Athens.



Figure 11 Photos from the Researcher's Night event in Athens

Athens Science Festival 2019

Date and place	Athens, Greece
Number of participants	Over 4000 visitors on Friday, April 7, 2019, over 30000 overall
URL	http://www.athens-science-festival.gr/

The 6th Athens Science Festival was held in Technopolis, City of Athens, between April 3 and 7, 2019, and this year it focused on good practices in order to reduce our environmental footprint and to plan a future for global protection to go hand in hand with growth. The Athens Science Festival is the largest exhibition on science and technology applications in education in Greece, with over 30,000 visitors in each event in recent years. GAIA, in collaboration with the 3rd High School of Nea Philadelphia and the 1st Primary School of Neo Psychiko, presented the visitors with an interactive installation using Arduino, Raspberry Pi and conductive paint. Visitors were able to interact with the interactive table by tapping the corresponding icons, comparing measurements, and seeing the ranking of 8 different schools relative to their consumption and other environmental elements. The data came from the buildings of these schools, and visitors could see real-time conditions within their respective buildings.



Figure 12 Athens Science Festival 2019



Figure 13 Moments from the Athens Science Festival 2019 event

PatrasIQ 2019

Date and place	Patras, Greece
Number of participants	Over 3000 visitors
URL	http://patrasiq.gr/

The GAIA team participated at the Patras Innovation Quest Technology Transfer Exhibition (PatrasIQ) held on April 12 -14, in Patras, Greece. It is co-organized by University of Patras, the Ministry of Education, Research & Religious Affairs, the Ministry of Economy & Development, the Chamber of Achaia, the Region of Western Greece, the Hellenic Open University and the Technological Educational Institute of Western Greece. Its main objective is to create a critical competitive advantage both in the research community as well as in the productive sector, through a constant effort to solve problems and apply innovative ideas for the development of new products and services and the optimization of existing ones, which aspire to conquer a part of the national and global market. Patras IQ has been honored as the National winner and representative for the European Enterprise Promotion Awards (EEPA 2017), and has received the Education Business Award of 2016, and has been established as the continuous meeting of interconnection of know-how & innovation with entrepreneurship, with multiple positive effects; both on maintaining the rich research and entrepreneurial human capital of our country and on the overall development of the local, regional and national economy. T

The exhibition aimed at developing and strengthening cooperation between the research community and the productive sector. We have presented an interactive installation utilizing the data produced by the school buildings participating in the project.



Figure 14 The Patras IQ 2019 banner



Figure 15 GAIA's stand at the Patras IQ 2019 event

Patras Science Festival 2019

Date and place	May 8-11, 2019, Patras, Greece
Number of participants	Over 6500 visitors
URL	http://www.patras-science-festival.gr/

GAIA participated in the Patras Science Festival, presenting the project and the GAIA control panel to students from Patras and western Greece. The Patras Science Festival 2019 is organized by the Science Communication educational group and the Hellenic Open University, under the aegis of the Greek General Secretariat for Research and Technology, with the support of the Regional Directorate of Education in Western Greece and the Archaeological Museum of Patras, in collaboration with numerous academic, research and educational institutions. The event took place at the Greek Open University campus between May 8 and 11, 2019, with an additional special event organized on Saturday evening at the Archaeological Museum of Patras. We presented the GAIA control panel interactive installation, providing a playful introduction to the project to a large number of students and educators visiting the event.

The event has been attended by more than 6500 visitors this year³, as reported in the organizers website.



Figure 16 Scene from the Patras Science Festival 2019 event

³ <http://www.patras-science-festival.gr/news/perissoteri-apo-6500-episkeptes-sto-patras-science-festival-2019/>



Figure 17 Scene from the Patras Science Festival 2019 event



Figure 18 Scene from the Patras Science Festival 2019 event



Figure 19 Scene from the Patras Science Festival 2019 event

Didacta Digital Austria

Date and place	May 23 rd - 25 th 2019, Linz, Austria
Number of participants	3000
URL	https://www.didacta-digital.at

The didacta DIGITAL Austria Festival on digital education in Linz, provides the framework and the platform for new concepts, solutions and discussions that deal intensively with the digitalization in education, digital literacy, educational scenarios and concepts, digital teaching aids and apps, Making, Robotic, and Coding. It covers all educational ranges from kindergarten, school, tertiary education up to the adult education. It is aimed towards educators and trainers, school owners, school supervisors, parents, political decision makers, training providers, start-ups in education, experts from science, associations and institutions.

It is thus an ideal venue for GAIA to showcase its findings and results. OVOS is having a booth presenting its portfolio of digital education projects, including GAIA, while the event is estimated to be attended by 3000 participants.

Collaborations with other European research projects

In this section, we briefly present the activities organized together with other European research projects.

“The next day for Energy Efficiency” Workshop

Date and place	Wednesday, November 7 th , 2018. ELTRUN, Athens University of Economics and Business, Greece
Number of participants	40
URL	https://eltrun.gr/wp-content/uploads/2018/11/ENTROPY-Workshop-Agenda.pdf
Projects involved	ChArGED, GAIA, Benefice, MOBISTYLE, Green Soul, ECO-BOT, UtilitEE, ENTROPY

The aim of this workshop was to share experiences and visions among the projects funded under the same topic and to discuss on exploitation channels. GAIA project was represented by Synelixis Solutions and the results of the piloting activities were presented. The audience consisted of around 40 people from research, business and innovation sectors as well as from national policymaking bodies. During the discussions, it was evident that all projects and participants shared the vision of cultivating a more energy efficient behavior. Mobile apps and gamification was a focal point. GAIA seemed to have a significantly larger piloting basis (more countries, schools and students) than the other projects presented at the workshop. Another interesting point, which we plan to explore, was to integrate more sophisticated anomaly detection algorithms developed by other projects (e.g., ENTROPY) in the GAIA platform. Another important outcome, that GAIA had not adequately paid attention before, was the option to pursue exploitation through the Corporate Social Responsibility programmes.



Figure 20 Scenes from the workshop and GAIA's presentation

E2Data

E2Data⁴ is a H2020 research project that started on January 2018, in which the coordinator of GAIA (CTI) participates as a member of the consortium. The project conducts research on heterogeneous execution of big data-related applications on the cloud, while GAIA will provide energy-related as a real-world validation use-case. The project will support the existing infrastructure and further strengthen the sustainability aspects of GAIA. The GAIA infrastructure will be utilized as part of the use case portfolio of the project (for more information: <https://e2data.eu/about/use-cases>). E2Data will support the expansion of CTI's IoT infrastructure in Greece in order to accommodate larger-scale scenarios with additional sensing points.

3DLab

Date and place	Patras, Greece
Number of participants	20
URL	http://youthart.eu/3dlab/ https://youthart.eu/3dlab/3rd-project-meeting-in-patras

GAIA project was presented at the 3rd project meeting of the 3DLab Making with Brain, Technology and Hands project (Erasmus+). The main objective of the 3DLab project is to foster the growth of informal learning environments, which provide opportunities for young people to engage in craft making with the support of digital technology. The presentation of the GAIA was focused on the GAIA Lab kit and how it was applied to school community during the previous school year (2017-2018) and the new goals for the current school year (2018-2019). The participants had the opportunity to interact with the consortium, use the lab kit material and exchange ideas regarding its use in the context of the project. We received feedback on our designs and our overall approach to sustainability in the classroom, from a project that works on related fields in parallel.

⁴ E2Data website, <https://e2data.eu/>



Figure 21 A scene from the GAIA - 3DLab joint event



Figure 22 A scene from the GAIA - 3DLab joint event

Workshop “Italian Technologies for SMART City”

Date and place	October 5, 2018, Rome, Italy
Number of participants	50
URL	https://www.technologyforall.it/

OVER and the University of Sapienza gave a talk in the context of the fifth edition of the forum “Technologies for all 2018”. The Workshop, entitled Italian Technologies for SMART City has been organized by the SMART City and IoT Commission on behalf of Rome, Association of Engineers. It covered following topics:

- Promoting technological issues that make smart a city.
- Promoting the Italian excellence in the field of “Applied Innovation” for Smart City from an academic and industrial point of view.
- Sharing success experience in the field of SMART City.

During the talk, a promotion and a sharing of concepts and results obtained by the GAIA project were showcased as an example of success story.

Umi-Sci-Ed

UMI-Sci-Ed (Exploiting Ubiquitous Computing, Mobile Computing and the Internet of Things to promote Science Education) is a Horizon 2020 project, which aims at enhancing the attractiveness of science education and careers for young people (14 to 16-year old) via the use of latest technologies. UMI-Sci-Ed aims to empower youngsters to think creatively, apply new knowledge in an effective way, become continuously competitive in a highly demanding working environment. The ability to switch efficiently between different disciplines such as science disciplines depends on processing effectively the educational material based on clearly defined outcomes, expanding a broad repertoire of ICT communication, problem solving and decision-making skills, and using the collective knowledge represented in networks, based on working environments. The orientation of UMI-Sci-Ed is entrepreneurial and multidisciplinary in an effort to raise young boys’ and girls’ motivation in science education.

Since the 2 projects share a number of goals and try to achieve these goals using related approaches, GAIA and UMI-Sci-Ed partnered in order to produce additional material to be used in the context of the UMI-Sci-Ed educational activities on the one hand, while on the other hand GAIA has extended its base of related educational groups and end-users. The material contributed by GAIA can be found online⁵ at the project’s internal platform used by the educators participating in Umi-Sci-Ed.

⁵ <https://umi-sci-ed.cti.gr/umiscied/?q=content/gaia-green-awareness-action>

EsmartCity and Prefecture of Western Greece

EsmartCity⁶ is a project funded under Interreg MED. Its main objective is the improvement of the innovation capacity of the cities in the MED region by creating innovative ecosystems. To this end, the project aims to pilot the ideas of the Smart City, using digital technologies and energy efficiency technologies to provide better services to the citizens with less environmental impact. To this end, it will enroll to a multinational pilot deployment in the MED area related to the application areas of intelligent districts, smarter energy and smarter lighting. Furthermore, it will test its sustainability with experimentation and co-creation scenarios and intervening in MED territory innovation policy change strategies. Its pilot testing comprises energy efficiency in public buildings in Western Greece, Milan (Italy), Palmela, Setubal and Sesimbra (Portugal), and in this context measurements from GAIA's schools in Western Greece will be utilized to expand its scope.

CTI has discussed, together with the EsmartCity consortium, the prospect of utilizing the existing GAIA infrastructure in GAIA schools and offer its datasets to the Prefecture of Western Greece, as a means to provide remote monitoring in terms of energy consumption and environmental parameters. EsmartCity already has established links with the Prefecture of Western Greece, and since the 2 projects share similar goals, we have decided to join forces and reuse existing infrastructure for the benefit of the local community. As a side note, energy costs of public-school buildings in Greece are paid at a local government level and this makes the Prefecture of Western Greece an ideal partner for realizing the benefits of the GAIA approach. Although remote monitoring of energy consumption in public buildings in Greece has begun to be utilized more systematically, the scale of such an endeavor means it will take some time until it reaches a satisfactory scale. GAIA's infrastructure in the greater area of Patras provides such information, and along with future planned expansions to the range of utilized sensors, this will open additional possibilities to broaden GAIA's impact at a local level, while also ensuring the continuous operation and sustainability of the project's infrastructure.

⁶ <https://esmartcity.interreg-med.eu/>

7. Activities focused on the educational community

Scientix, Pan-Hellenic Scientix Conference on STEM training 2018

Date and place	September 3-4, 2018, Athens
Number of participants	100
URL	https://scientix.ellak.gr/

GAIA participated in the Pan-Hellenic Scientix Conference on STEM training, which was held on 3 and 4 September 2018 at the National Technical University of Athens. The aim of the conference was to highlight innovative educational practices from the Education of Informatics, Physics, Technology, Mechanics and Mathematics (STEM). We presented the GAIA approach in terms of educational content, which is based on the use of real-time environmental data from school buildings and their integration into classroom educational activities.

GAIA intends to make its educational scenarios available through the official Scientix portal in the months following the project’s completion:

<http://www.scientix.eu/web/guest/projects/project-detail?articleId=689542>



Figure 23 A scene during the presentation of GAIA at the Scientix event

GAIA Summer school 2018

Date and place	July 2018, Pallini, Greece
Number of participants	25
URL	http://play-create-learn.ea.gr/

The consortium, and in particular EA and CTI, have initiated the organization of a summer course during 2018, aimed towards educators from all the countries participating in GAIA. This will be the second summer course organized by the consortium, and will aim for a much larger participation than the first one, since the consortium will have already built a large network of collaborators through the trials phase of the project. More details regarding this summer course can be found at the website for this action (<http://play-create-learn.ea.gr/>), as well as the respective section for GAIA (<http://play-create-learn.ea.gr/GAIA>).



Figure 24 A scene from the Play-Create-Learn event

Workshop with teachers at Gramsci Keynes School

Date and place	7 March 2018, Prato, Italy
Number of participants	4
URL	N/A

In the framework of the third Gaia Workshop at Gramsci-Keynes school, 4 new teachers took part to the discussion, showing interest in taking part in our project. After a very brief introduction about the project, we started showing them the practical activities they can do with their students: how to play with the Gaia Challenge, how to monitor the data collected from the sensors in the school with the BMS and we helped them giving some example of formative activities built on purpose for the Gramsci-Keynes school.

At the end of the meeting, we encouraged all the teachers to promote the project and the related activities with their colleagues.

Contest Prize announcement to students – open to students

Date and place	8 June 2018, Prato, Italy
Number of participants	40 students
URL	N/A

On Friday 8th June, the last day of school, the ceremony for the Italian schools took place at the Gramsci-Keynes school in Prato. Classes 1 ELS, 2 DLS and 1 EE finished first in both CONTEST 1 for the best energy reduction result and CONTEST 2 for Best Portfolio together with Pentavrisso School. They won a tablet and a Raspberry Pi with a sensors kit. The ceremony took place in the auditorium of the school; the students also received a certificate of participation to the GAIA activities.



Awarding students with Contest Prizes

Date and place	25 October 2018, Prato, Italy
Number of participants	20
URL	N/A

We awarded the school with the prizes gained within the GAIA Contest 2018 (one tablet and one sensor kit). The prizes have been given to the school principal with the participation of a delegation of students and teachers.

Then we had a meeting with four teachers to propose and discuss GAIA educational activities to be carried out this school year. Hereafter a list of proposals:

- Participation of new classes to the GAIA Challenge.
- Preparation of new content for the GAIA Challenge.
- Monitoring and experimentation activities using GAIA sensors (e.g. energy saving in the school hall and monitoring devices' energy consumption behavior in the PC laboratory).
- Hands-on activities with the Sensor Kit.
- Build your IoT application in GAIA with Node-RED (<https://nodered.org/>) to support energy-saving class activities.



Figure 25 Students receiving their awards

Workshop in the Gramsci Keynes School in Prato with students

Date and place	13 February 2019, Prato, Italy
Number of participants	30 students
URL	N/A

CNIT organized a seminar held by OVER in the Gramsci Keynes school in Prato. Two classes of the Scientific Lyceum participated to the seminar. The seminar introduced main concepts related to energy and energy efficiency and carbon footprint. The students were also given some data on carbon footprint of different transportation means and the average carbon footprint of European countries. Finally, some data on the energy consumption of the school in Prato were provided to promote their awareness and their intervention in the daily life. The second part of the workshop was devoted to introduce the ICT tools provided by GAIA, and how they could use them while performing energy-saving activities.

Meeting with Educational Council of Vienna

Date and place	October 8 th , 2018, Vienna
Number of participants	2
URL	N/A

Jörg Hofstätter from OVOS presented GAIA at the office of Jürgen Czernohorsky, education councilman of Vienna, contact point with City of Vienna, education director Heinrich Himmer and managing partner of Bildungsserver Vienna.

Future learning LAB Vienna, e-schools Vienna Teacher Event

Date and place	January 22 nd 2019, Vienna
Number of participants	15
URL	https://futurelearning.at

Andreas Friedl from OVOS presented GAIA in front of approximately 15 teachers and decision makers. Erika Huemer from the Ministry of Education was excited and suggested to include the Project in the Eduthek (www.eduthek.at), the official E-learning Platform from the Ministry of Education in Austria.



Figure 26 OVOS presents GAIA at the e-schools event in Vienna

Learntec

Date and place	January 29 th – 31 th 2019, Karlsruhe
Number of participants	11600 (estimated)
URL	https://www.learntec.de/en

OVOS had a booth and showcased GAIA on LEARNTEC, the biggest digital learning fair in Germany with over 11.600 participants. This year the event included 341 exhibitors from 15 countries, with OVOS having a booth showcasing its educational portfolio, including the GAIA Challenge.



Figure 27 The booth of OVOS at Learntec

eLearning Bazar

Date and place	March 14 th 2019, Vienna
Number of participants	250
URL	https://ebazar.phwien.ac.at/

Jörg Hofstätter FROM OVOS presented GAIA Challenge at the teachers' event with about 250 participants, teachers and students.



Figure 28 A scene from the New Media and Learning Technologies event

Teachers event: New Media and Learning technologies

Date and place	March 20 th 2019, Krems, Lower Austria
Number of participants	150
URL	https://www.kphvie.ac.at/fort-weiterbilden/news-aus-der-fort-und-weiterbildung/fort-und-weiterbildung-detailnachricht/article/2003-neue-medien-und-lerntechnologien-im-unterricht.html

Jörg Hofstätter from OVOS held a workshop on GAIA at this event, with about 150 participating teachers.

Presentation of GAIA projects to students, School of Engineering, University of Florence

Date and place	24/05/2018, Florence
Number of participants	25
URL	N/A

CNIT and OVER made an introduction to the Internet of Things, Architectures, Architecture of the GAIA platform as an example of IoT architecture, adoption of related software patterns and REST architectural style. The audience consisted of students of the School of Engineering at the University of Florence. Students had the opportunity to play with the GAIA technologies presented in the workshop, while the consortium received feedback on its software lineup.



Figure 29 Scene during a presentation of GAIA by OVER

Workshop in Sapienza

Date and place	May 2018, Rome
Number of participants	60
URL	N/A

During the month of May 2018, OVER held a workshop in the Department of Computer, Control, and Management Engineering Antonio Ruberti of Sapienza, University of Rome. The seminar has been organized in more days and three modules have been treated. The workshop has been structured in a similar way to what we did in the first edition, held in May 2017. In the first two modules we discussed about theoretical aspects, presenting an outline of the project along with its objectives and introducing the software infrastructure in all its components.

In the last module of the workshop, students had a view of applications deployed focusing more on the technical aspects (API interfaces among them). At the end of this part, three project proposals have been discussed with the attenders inviting them to join the GAIA community contributing to the development of new functionalities using GAIA existing API and its dataset.

Several project proposals were presented and were implemented during the respective semester. For each project, students presented an archive with all the produced material and a brief report explaining the work and the obtained results. Furthermore, one of the students who has worked in one of these projects is now part of OVER's Research and Development Team.

Seminar in Prato

Date and place	24/05/2018, Florence
Number of participants	50
URL	N/A

OVER's Energy Manager had a seminar about energy topics with the aim to increase energy awareness in students of Prato and propose possible activities to save energy acting on the own behavior. The seminar was divided in two parts; the first, where we presented general concepts about energy such as the way in which electricity is produced and, the concept of carbon cycle. Practical examples, like the convenience of the electrical car or a comparison among national electricity mix emission factors have been explained. The second part of the seminar covered more specifics topics for the two different participating curricula. For the Surveyor, class a more in-depth explanation was performed about energy efficiency in buildings (i.e., thermal transmittance), whilst for scientific curricula initial concepts about heat pumps have been treated.

8. Consortium Member Communication and Dissemination Activities – Year 3 and on

In this chapter, we outline the activities undertaken by each GAIA consortium member active in WP5, with respect to dissemination aspects of the project.

Quantification of GAIA Dissemination Activities for the 3rd year

The following table provides a quantification of the project's dissemination activities, via the dissemination KPIs as provided in D1.1, plus an additional column reporting the actual implementation status. This sets a basis for verifying whether the project dissemination objectives are being met. Specifics about activities mentioned in this table are included in the following chapters of this document.

KPI	Name	Brief description	Validation Methodology	GAIA target	Status at the end of the project
GB.1	Time spent using Web portal	The time spent by end-users on the GAIA portal and web interfaces, as a measure of end-user engagement	Use server-side system logging components, monitoring all related activity, while also having in mind privacy issues	7 – 10 hours	The average time for BMA visits is 10 minutes, for GAIA Challenge it is 18 minutes for every visit, both excellent results.
GB.2	Persons using web portal	An estimate of the number of different end-users utilizing the GAIA web portal	Server-side system logging (see GB.1)	30-40% of target group	Project site: 21082 all-time views BMA: 254 unique users GAIA Challenge: 3735 registered users
DRA.1	#workshops organized/co-organized	Number of scientific workshops organized/co-organized by GAIA	Organization of workshops	4	7 (3 in the previous period)

DRA.2	# participants to workshops	Number of participants to scientific workshops organized/co-organized by GAIA	Count of participants	200	225 (60 in the previous period)
DRA.3	#papers submitted in conferences	Number of scientific reports submitted to international conferences with review process	Count of paper submissions	8	9 (6 in the previous reporting period)
DRA.4	#papers submitted in journals	Number of scientific reports submitted to international journals with review process	Count of paper submissions	3	7 (3 in the previous reporting period)
DRA.5	#newsletters	Number of GAIA newsletters produced by the consortium disseminating GAIA news	Release of newsletters	9	7 (3 in the previous reporting period, 1 planned to be released after the project ends)
DRA.6	#press releases	Number of press releases issued by GAIA	Count of releases	4	3 (2 in the previous reporting period)
DRA.7	Joint actions with other projects	Actions organized together with other related research projects in order to promote GAIA and sustainability aspects	Organization of actions	3	6 (3 in the previous period, 1 planned for the following months)
DRA.8	Bringing together schools and other EU actions	Actions for bringing schools in touch with other similar projects and related EU actions in the context of energy savings and sustainability	Organization of actions	2	3 (2 GAIA contests, 1 workshop with schools and projects)
DRA.9	Attendance at relevant expos, conferences,	Attendance of GAIA consortium members at topically relevant expos, conferences, symposia, etc.	Info from consortium members	15	20 (9 in the previous reporting period with 2 expos, 6

	symposia, etc.				conferences, 1 European-wide event)
DSN.1	#social networking platforms	Number of social platforms where GAIA will have an active and continuous presence	Track and count	6	9
DSN.2	#social networking users	Number of social networking platform users that will be connected to GAIA presence in those platforms	Track follower numbers, while also having in mind privacy issues	300	1124 (as of May 12, 2019)
DSN.3	Articles in local media	Number of articles submitted by GAIA consortium members to local media	Gather info from consortium members and simple count	5	5 (1 in previous reporting period)

Article for GAIA on the online version of the local magazine of Tetartopress (with a weekly printed version): <http://tetartopress.gr/prasini-antilipsi-se-drasi-me-protagonistes-ta-scholia/>

Article for the participation of the Gramsci Keynes School in the “La Nazione” newspaper, 3/5/2018.

10 CRONACA PRATO LA NAZIONE GIOVEDÌ 3 MAGGIO 2018

LA NOSTRA SCUOLA

CLASSI SUL PODIO

LE TRE CLASSI DEL GRAMSCI-KEYNES CHE HANNO SUPERATO I TEST DEL PROGETTO CLASSIFICANDOSI NEI PRIMI CINQUE POSTI DELLA GRADUATORIA INTERNAZIONALE SONO LA I ELS, II DLS E LA I EE

Studenti insegnano le buone pratiche

Luce spenta nell'atrio per risparmiare

Il Gramsci-Keynes vince il progetto europeo per la tutela dell'ambiente

DALLA GRECIA alla Svezia passando per Prato. Sono gli studenti del Gramsci-Keynes ad essersi aggiudicati i primi posti del bando europeo nato per promuovere le buone pratiche in fatto di ambiente. In particolare tre classi del Gramsci-Keynes sono tra le prime cinque finaliste del progetto Gaia 'Green Awareness In Action - consapevolezza verde in azione'. Il progetto, finanziato dalla comunità europea, ha come obiettivo quello di promuovere cambiamenti positivi nello stile di vita delle comunità riguardo ai consumi e la consapevolezza sull'efficienza energetica. Gli studenti pratesi si sono così trasformati in sentinelle-verdi misurando i consumi all'interno dell'istituto di via Reggiana attraverso delle centraline: grazie alle misurazioni gli studenti hanno potuto abbattere i consumi di energia. Solo facendo attenzione alla luce dei corridoi della scuola, adesso ogni giorno riescono a risparmiare all'ambiente l'equivalente di 18 chili di anidride carbonica. Nell'ambito del progetto Gaia infatti è stata prevista l'installazione di numerosi sensori per rilevare parametri ambientali e consumi energetici in tempo reale, in alcune scuole pilota in Grecia, Svezia e appunto Prato. Nell'ambito del progetto i ragazzi hanno dovuto sostenere dei test online sulle tematiche ambientali, effettuare delle osservazioni nella scuola a partire dai dati registrati dai sensori, effettuare delle sperimentazioni e deduzioni sui cambiamenti di stile di vita che possono migliorare il nostro pianeta riducendo l'immissione di Co2. Alcuni lavori realizzati dagli studenti nell'ambito del progetto sono reperibili sul portfolio delle classi in rete al link: <http://gaia-challenge.com/it/>. A breve i progetti realizzati dai ragazzi saranno messi in rete, e fatti circolare sui principali social network (memes, gif, video) proprio per sensibilizzare i cittadini sulle tematiche ambientali.

LA COSA che rende il progetto ancora più interessante e soprattutto l'impegno degli studenti ancor più eccezionale, è il fatto che il progetto non prevede alcun premio per le classi che hanno mostrato maggiore virtuosismo. Le tre classi del Gramsci-Keynes che hanno superato tutti gli ostacoli del progetto classificandosi tra i primi cinque posti della graduatoria internazionale sono la I ELS, II DLS e la I EE: «I nostri ragazzi hanno mostrato avere una eccellente sensibilità rispetto alle tematiche ambientali e un eccellente spirito di squadra. Sono stati davvero eccezionali, hanno risposto a test, realizzato progetti e misurato i consumi dalla scuola. Grazie al loro impegno ogni giorno immettiamo nell'atmosfera 18 chili di anidride carbonica spengendo a luce nell'atrio in modo consapevole», dice soddisfatto il professor Giacomo Simoni.

Silvia Bini

Gli studenti del Gramsci-Keynes che hanno partecipato al bando europeo per promuovere le buone pratiche in fatto di ambiente

Article for GAIA at the portal of thebest.gr, the major news portal of Western Greece, with over 70 million page views per year:

<https://www.thebest.gr/article/524855->

Interview for GAIA at the University of Patras TV channel, with a separate interview at the University of Patras Radio station (scheduled to be available online May 2019):

<https://www.youtube.com/watch?v=ZSY8pnJYRz0>

Article for the participation of the schools of Volos in the project in the “Tachidromos” local newspaper:

<https://www.taxydromos.gr/E.Chanou/310824-aisththres-metrhshs-katanalwshs-energeias-sto-8o-gel-kai-sto-prwhn-galliko.html>

DSN.4	Articles in online media	Number of articles referring to GAIA published in online media outlets that have a topical interest in the issues GAIA is addressing	Tracking of hashtags, shares, retweets, comments, likes, etc.	5	5 (1 verified to be posted during June 2019)
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<http://www.thebest.gr/news/index/viewStory/524855>

<https://www.taxydromos.gr/E.Chanou/310824-aisththres-metrhshs-katanalwshs-energeias-sto-8o-gel-kai-sto-prwhn-galliko.html>

<http://volos.ert.gr/blog/2018/09/24/eyropaiko-programma-gia-exoikonomisi-energeias-sta-scholeia/>

<https://teeschoolsmed.wordpress.com/2019/04/15/h2020-project-for-energy-savings-through-behavioral-change-in-students-and-educators/>

An article about GAIA’s interactive installations is verified to be made public on Bare Conductive’s online blog in June 2019 (<https://www.bareconductive.com/news/>).

Overview of Individual Partners Activities

In this section, we provide an overview of the WP5-related activities of each member of the consortium.

CTI

As the project coordinator, CTI has been involved in many activities on a wide variety of levels – from the early planning stages to the execution and follow-up phases. CTI has organized the the PerSCB workshop for the PerCom 2018 conference, as well as the BRAINS workshop for the Aml 2018 conference. It has also established the links to the Scientix educational community and has been continually expanding the network of schools in Greece that participate in the project. CTI has also cooperated with EA to co-organize a GAIA summer course in 2018, in the context of the Play-Create-Learn workshop. CTI also assisted in maintaining the project website and has contributed with a set of new videos uploaded on the

project's YouTube channel. CTI participates in the E2Data research project that began on January 1st, 2018, that will cooperate with GAIA with respect to open big datasets for energy efficiency.

In terms of dissemination output in the form of publications in journals and conferences, CTI has produced/participated in the following publications:

- Georgios Mylonas, Dimitrios Amaxilatis, Lidia Pocero, Iraklis Markelis, Joerg Hofstaetter, and Pavlos Koulouris. "Using an Educational IoT Lab Kit and Gamification for Energy Awareness in European Schools". Conference, in Proceedings of the Conference on Creativity and Making in Education (FabLearn Europe'18). ACM, New York, NY, USA, 30-36. <https://doi.org/10.1145/3213818.3213823>.
- Γ. Μυλωνάς, Χ. Τζιορτζιώτη, Ε. Μπουφαρδέα, Η. Μαρκέλης, Π. Κουλούρης, "Ευαισθητοποιώντας την Ελληνική Σχολική Κοινότητα σε Θέματα Εξοικονόμησης Ενέργειας". Conference 5ο Πανελλήνιο Εκπαιδευτικό Συνέδριο Κεντρικής Μακεδονίας με θέμα: «Αξιοποίηση των Τεχνολογιών της Πληροφορίας και των Επικοινωνιών στη Διδακτική Πράξη», Θεσσαλονίκη, 2018.
- G. Mylonas et al, "An Augmented Reality Prototype for supporting IoT-based Educational Activities for Energy-efficient School Buildings". Journal, Accepted for publication to the Electronic Notes in Theoretical Computer Science, Elsevier.
- Ε. Μαυρομμάτη, Χ. Τζιωρτζιώτη, Γ. Μυλωνάς, Ι. Χατζηγιαννάκης, "Σενάρια για εκπαιδευτικές δραστηριότητες που χρησιμοποιούν δεδομένα από το Διαδίκτυο των Αντικειμένων". Journal, Διεθνές περιοδικό «ΑΝΟΙΚΤΗ ΕΚΠΑΙΔΕΥΣΗ – το περιοδικό για την ανοικτή και εξ αποστάσεως εκπαίδευση και την εκπαιδευτική τεχνολογία»
- G. Mylonas et al, "An Educational IoT Lab Kit and Tools for Energy Awareness in European schools". Journal, in International Journal of Child-Computer Interaction, Elsevier, <https://www.sciencedirect.com/science/article/pii/S2212868918301004>
- G. Mylonas, I. Chatzigiannakis, D. Amaxilatis, F. Paganelli, A. Anagnostopoulos, "Enabling Energy Efficiency in Schools based on IoT and Real-World Data". Journal, IEEE Pervasive Computing, Volume: 17, Issue: 4, Oct.-Dec. 1 2018.
- G. Cuffaro, F. Paganelli, G. Mylonas, "A Web Resource-based Rule Management Framework for the Internet of Things". Journal, Elsevier, Journal of Network and Computer Applications. Under review, submitted April 2019.
- G. Mylonas, D. Amaxilatis, L. Pocero, S. Tsampas, J. Gunneriusson, "A Methodology for Saving Energy in Educational Buildings Using an IoT Infrastructure". Submitted to the IISA 2019 Conference, under review, May 2019.

SK

SK has been actively involved with dissemination activities relating to the progress of the project in their educational networks along with regional organizations to which they are involved. SK has also been an active participant in promoting the project's social media activities, organizing a number of Söderhamn-based activities, targeting the local community of the town, as well as the overall urban area. This series of activities has been held at a regular pace throughout the reporting period for this document, resulting to greater dissemination of the project activities to a wider audience in Sweden.

It has also contributed to the following publication:

- G. Mylonas, D. Amaxilatis, L. Pocero, S. Tsampas, J. Gunneriusson, “A Methodology for Saving Energy in Educational Buildings Using an IoT Infrastructure”. Submitted to the IISA 2019 Conference, under review, May 2019.

EDOC

EDOC, as the WP5 leader until its departure from the project consortium, oversaw the implementation of the strategy for dissemination for the project, while it also maintained the majority of the social media aspects related to GAIA. It also participated in the preparation of press releases and newsletters, as well as presented the project to business partners of the company and other stakeholders in Sweden. EDOC has ceased its activities for this work package during summer 2018.

CNIT

CNIT contributed to website management, content production and translation into Italian of the produced dissemination material. CNIT has also co-authored two papers submitted to international journals.

- G. Mylonas, I. Chatziannakis, D. Amaxilatis, F. Paganelli, A. Anagnostopoulos, “Enabling Energy Efficiency in Schools based on IoT and Real-World Data”. Journal, IEEE Pervasive Computing, Volume: 17, Issue: 4, Oct.-Dec. 1 2018.
- G. Cuffaro, F. Paganelli, G. Mylonas, “A Web Resource-based Rule Management Framework for the Internet of Things”. Journal, Elsevier, Journal of Network and Computer Applications. Under review, submitted April 2019.

A series of seminars on the GAIA project has been provided to students of the master’s degree in Telecommunication Engineering and Computer Engineering at the University of Florence. A student project has also been carried out related to the GAIA objectives. CNIT has also produced some dissemination material to be used inside the Gramsci Keynes School for disseminating project objectives among students. CNIT has also produced dissemination content (brochure) to be sent to additional Italian schools and teachers.

SYN

SYN has developed a series of video demonstrating the building manager application and has been a diligent supporter of dissemination GAIA information across SYN’s social network channels. SYN has co-organized the “Next Day for Energy Efficiency” Workshop in Athens, in collaboration with a number of GAIA’s sister projects. With regard to T5.2, SYN has been in communication with the Greek school stakeholders and activities to attract additional schools. Finally, as task leader for the upcoming T5.3, SYN has overseen the drafting of a business plan for the Building manager application and a business plan for the participatory sensing application, as reported in deliverable D5.5, “Sustainability Plan & Innovation Roadmap”.

OVER

OVER has participated in a number of public events to disseminate project findings and its key concepts. In particular, it has co-organized, together with CNIT, a series of workshops targeting students in Rome and Prato that utilized the GAIA ecosystem in the context of hands-on activities. Additionally, OVER has participated in dissemination activities through their own social networking accounts and provided private customers and other companies with whom OVER has relationships information regarding the project for T5.2.

EA

EA has been actively involved mainly with dissemination activities related to the educational part of the project. It was the main organizer for the Play-Create-Learn workshop in Athens, and the GAIA summer course associated with this workshop. It has also participated in other related events like the Scientix conference in Athens, while also contributing to the following publications:

- Georgios Mylonas, Dimitrios Amaxilatis, Lidia Pocero, Iraklis Markelis, Joerg Hofstaetter, and Pavlos Koulouris. "Using an Educational IoT Lab Kit and Gamification for Energy Awareness in European Schools". Conference, in Proceedings of the Conference on Creativity and Making in Education (FabLearn Europe'18). ACM, New York, NY, USA, 30-36. <https://doi.org/10.1145/3213818.3213823>.
- G. Mylonas et al, "An Educational IoT Lab Kit and Tools for Energy Awareness in European schools". Journal, in International Journal of Child-Computer Interaction, Elsevier, <https://www.sciencedirect.com/science/article/pii/S2212868918301004>

Since EDOC's departure from the consortium, EA has been assigned the role of the WP5 leader, and has also contributed to the production of the 2 GAIA booklets presented in this document.

SPARK

Spark Works has been involved in promoting the project to network of stakeholders formed during the last 3 years, and especially with respect to the SME and corporate audience for the project. SPARK has also contributed efforts towards the implementation and the wider promotion of the two GAIA contests held in 2018 and 2019. SPARK has also, together with SYN, contributed greatly to drafting the project's "Sustainability Plan & Innovation Roadmap", as reported in Deliverable D5.5.

OVOS

OVOS has dedicated resources to contacting school networks in Austria and Germany, in order to establish connections with the educational communities in the German-speaking parts of Europe. It has participated in a large number of exhibitions events in 2018 and 2019. It has also contributed greatly to the production of visual assets for the project that are utilized by all member of the consortium. OVOS, together with EA, CTI and CNIT, has also contributed to the production of the 2 GAIA booklets, and participated in the following publications:

- Georgios Mylonas, Dimitrios Amaxilatis, Lidia Pocero, Iraklis Markelis, Joerg Hofstaetter, and Pavlos Koulouris. “Using an Educational IoT Lab Kit and Gamification for Energy Awareness in European Schools”. Conference, in Proceedings of the Conference on Creativity and Making in Education (FabLearn Europe'18). ACM, New York, NY, USA, 30-36. <https://doi.org/10.1145/3213818.3213823>.
- G. Mylonas et al, “An Educational IoT Lab Kit and Tools for Energy Awareness in European schools”. Journal, in International Journal of Child-Computer Interaction, Elsevier, <https://www.sciencedirect.com/science/article/pii/S2212868918301004>

9. The GAIA Booklets

GAIA, right from the start of the project, aimed for a pan-European approach that can be applied to as many schools as possible. This involved two different dimensions: the production of educational material, so that the educational community can re-use what has been achieved in the project in a structured manner, and the production of dissemination material, in order for the community to be aware that such educational material from GAIA exists in the first place.

Furthermore, in terms of questions that could help to explain the direction we have taken in the project and why we have focused our efforts on answering them, the first one is whether the use of real-time IoT data from the end-users' environment, i.e., the school buildings where students and teachers spend a large part of their time, can act towards motivating them to participate in energy-saving activities. GAIA's approach is based on such data in order to act on a personal level and change behavior inside buildings, instead of focusing solely, e.g., on replacing inefficient electrical appliances. A second question is whether the implementation approach taken by the GAIA project in terms of decisions like using open-source IoT software and hardware, along with educational activities, works in practice inside European classrooms. Moreover, one central question is whether hands-on educational activities like the ones described in this work can be successfully integrated into the curriculum of schools in Europe.

In terms of a broader educational setting and contribution to the community, our work can be seen as a verification of the fact that educational activities using IoT hardware and software and that are flexible enough to be combined with the curriculum of each school can produce good results. Moreover, in practice we have seen that educators can often be indifferent towards educational activities that do not take into account their background, or require them to spend considerable amounts of time to adapt the content to their school's schedule. Having this in mind, we produced content that could be tied together with various classes, is accompanied by educational material and gamification aspects, and also has some tangible goals that can be achieved by students in their own environment, with respect to energy savings. From our experience, the most important issue in this case is to communicate that such activities present an opportunity for educators and schools to integrate new aspects in existing curricula.

Having the above in mind, the GAIA consortium decided to “codify” the existing educational material produced during the project, in the form of two booklets. The aim is on the one hand to produce a set of best practices, guidelines and examples for putting the GAIA philosophy into practice, and on the other hand to offer a set of concrete material based on the educational lab kit activities produced in the last two years. We have thus ended in producing the following two books:

- The GAIA Playbook, which is a collection of the best practices, design guidelines and templates for educational activities aimed towards educators, along with a set of practical examples for utilizing this material in practice.
- The GAIA Lab Kit booklet, which offers a structured set of lab activities based on the Educational Lab Kit material produced for the project. It contains lesson plans for educators, handouts for students, along with guidelines on how to implement energy-saving activities built around IoT technologies.

Although we utilize GAIA's technologies as our implementation substrate, in both cases these booklets target a broad audience, and are written with this in mind: the technologies utilized are in many cases open source, while they also follow current popular design choices. In other words, it is safe to assume that schools and educators outside the GAIA project can take these booklets and apply their guidelines in their own environment. The approach followed means it aims to be replicable for any schools that wish to combine science/technology classes with a twist on energy efficiency and sustainability. We continue this section by providing an overview of what is included in the two booklets, which will be made available shortly after the completion of the project.

The GAIA Playbook

The GAIA playbook is meant to serve as the culmination of the produced educational guidelines material, or as "best-of" compilation of templates and activities, aimed towards educators that are interested in conducting energy-saving activities in their schools. A number of elements included in the Playbook have been first reported in deliverables for WP1 and WP4 in the project. The aim was to make a selection of the most practical ones, that can be integrated within a school curriculum and be used to kickstart sustainability awareness and energy-saving activities together with students.

GAIA design philosophy

We outline the main design elements in GAIA's philosophy, in order to make it clear to educators and researchers what we are trying to achieve and the strategies to implement this vision.

Templates for energy-saving activities

As included in past deliverables for WP1 and WP4, we provide a number of energy-saving activities, that serve as templates for integrating them into any school interested in such activities. They are not meant to be used exactly as-is, although in essence it is possible to put them in practice in a simple form.

The GAIA energy-saving methodology

In this section, we provide a detailed description of the methodology we propose for integrating energy saving activities into the daily life of a school that has installed an IoT infrastructure in its building to monitor certain parameters, such as its overall power consumption. Its design follows the overall philosophy of the GAIA project, but is not limited to GAIA's implementation or specific hardware/software used in the project. In general, in order to change the behavior of students and teachers in terms of energy consumption and achieve sustainable results, GAIA utilizes a loop-based approach focused around three pillars: raise awareness, support action, and foster engagement. In the context of the proposed methodology, this could be realized by following a series of simple steps, in which students and teachers successively study their environment, monitor the current situation and detect potential issues, devise a strategy to achieve energy savings and act, and then monitor and review the results of their actions.

Examples of use cases in schools applying the GAIA methodology

We include a number of examples of the methodology's application in schools in Sweden, Greece and Italy. These examples cover several different scenarios, in order to highlight the possibilities available to the schools when using the data from an IoT infrastructure like the one implemented in GAIA. E.g., one use-case tackles electricity consumption overall in the building, while another one focuses on lights in the school building's corridors.



Figure 30 The cover of the GAIA Playbook

The GAIA Lab Kit Booklet

As one of the main elements in the project’s educational strategy, we decided in the first year of the project to create the GAIA Educational Lab Kit, to complement the more theoretical elements of GAIA’s educational material. In short, the kit aims to teach students using a “hands-on” approach, in which they get to use IoT components and electronics during lab activities in classroom. Based on guides provided by the project, they examine data from their school building and go through the peculiarities of consuming energy, how the building behaves in the various classrooms in terms of environmental parameters, and more. The kit includes already assembled devices and commercial IoT sensors and actuators to allow students complete classes and lab tutorials regarding energy and sustainability, as well as provides guidelines for implementing crowdsensing quests (also related to the gamification component of GAIA, the Challenge). In such quests, students create a “map” of specific parameters, e.g., energy, insulation, in their school building. It also serves as an additional means of interacting with the project and further increasing the end-user engagement, along with the other tools of GAIA, such as the gamification platform and the BMA (Building Manager Application).

Regarding the actual bill of materials for the Lab Kit, we utilize the following components:

- Raspberry Pi model 3B or 3B+, as the device handling the main computing and networking duties for the lab activities.
- Conductive ink markers, for sketching out wire paths onto paper
- Electronic components, such as LCD screens, resistors, switches, potentiometers, etc. At this point, we are using components with magnetic clip attachments, for greater ease-of-use and overall safety.
- GrovePi sensors with standardized interfaces for connecting to the Raspberry Pi, an open-source family of sensors available from various distributors, which use standardized interfaces and are suitable for educational activities due to their design.
- Custom electronic boards, which ease interfacing with GAIA and visualization of real-time data used during the lab activities.

Regarding the overall organization of the activities and the provided material, the consortium has prepared a series of lab activities, covering aspects of energy consumption and efficiency inside school buildings. The thematic list covered is the following: a) Energy consumption in our school, b) Lighting inside school buildings, c) Heating inside school buildings, d) Temperature, Humidity and Thermal Comfort, e) Devices and Energy efficiency, and f) Energy Inspectors - The energy footprint of our building. An additional activity can be implemented in case schools would like to implement an interactive installation in the form of a class project by students, in order to depict some kind of energy efficiency metric in its own school building.

Regarding the provided material in the booklet, there are available guides for a number of Lab Kit activities. In the description of each activity, we include the title of the subject, the necessary cognitive background for the students’ teams (theoretical and practical) and a short description of the tasks to be completed (goals). One set of material concerns the educators, identifying the educational target for each activity, the methods used, as well as a schedule for the proposed lab activity. Another set of material

addresses the students' part, giving specific instructions on how to perform the envisioned activities, explaining how to interconnect sensors and electronic components, and how to execute the Python scripts provided by the project. Difficulty levels are also indicated in the material, with more complex challenges such as coding questions and exercises are available for e.g., high school, or more advanced students).

As an example of a lab kit activity, we present here briefly the activity “Temperature, Humidity and Thermal Comfort”, in order to give an idea about what the lab kit activities actually include. Students are given a short introduction to the aims of the activity, as well as instructions on how to draw circuits for the lab using conductive ink, on top of a printed floorplan of their school. They are then instructed to assemble a small electronic circuit using 2-color LED lights, buttons and an LCD screen, and place the components over a predefined set of classrooms in the floor map. After assembling the circuit, the students power up the Raspberry Pi', and start looking into the Python code. They execute a series of available Python scripts that connect to GAIA's cloud infrastructure to fetch real-time data. They then go through a series of activities, where they see the temperature and humidity inside their classrooms, which are visualized on the LED lights of the circuit (e.g., red for temperatures above 25 degrees) and the LCD screen. By using hardware switches and buttons, students can navigate between different visualization modes. A set of guidelines provides the background to assess thermal comfort levels, to note down differences between classrooms, and try to reason the origin of such differences due to room orientation, construction, etc. They also provide examples of how to customize the Python code to provide additional functionality and visualization modes.

As an additional element for lab activities, we include in the booklet a description of the Node-RED plugin developed for GAIA. Node-RED is a tool used in IoT-related activities by both the educational and the research community. It is an additional element in providing GAIA-agnostic templates for realizing educational activities in the classroom.



Figure 31 The cover of the Lab Kit booklet



on top of a metal surface. The use of magnets prevents the components from slipping and moving around during the lab kit activity. We also utilize printed school building floorplans (see e.g., the ones included in the annex of this document). The floorplans are meant to be placed on top of a metal surface, so that magnets are kept firmly connected during the lab activities.

Regarding the actual bill of materials for the Lab Kit (explained in more detail in subsequent chapters of this document), we utilize the following components:

- Raspberry Pi model 3B or 3B+, as the device handling the main computing and networking duties for the lab activities.
- Conductive ink markers, for sketching out wire paths onto paper.
- Electronic components, such as LCD screens, resistors and switches. We use components with magnetic clip attachments, due to ease of use and safety.
- Open-source GrovePi sensors with standardized interfaces for connecting to the Raspberry Pi.
- Custom electronic boards, which ease interfacing with GAIA and visualization of real-time data used during the lab activities, such as a LED ring board to visualize energy consumption.

Regarding the software part of the Lab Kit, we use the Raspbian Linux distribution, while the activities are based on a number of Python scripts. The activities use the default options for Python provided by Raspbian. We use the standardized Web interfaces of GAIA for communicating with the system for real-time data.

GAIA has prepared a series of lab activities, covering aspects of energy consumption and efficiency inside school buildings. The thematic list covered is the following: a) Energy consumption in our school, b) Lighting inside school buildings, c) Heating inside school buildings, d) Temperature, Humidity and Thermal Comfort, e) Devices and Energy efficiency, and f) Energy inspectors - The energy footprint of our building. The last two activities are based on using additional smartphone apps and equipment, and are not covered in this book.

Regarding the activities in this book, we provide guides for each activity, in the form of lesson plans for the educators and activity guides for the students. In the description of each activity, we include the title of the subject, the necessary cognitive background for the teams (theoretical and practical) and a short description of the tasks to be completed (goals). One set of material concerns the educators, identifying the educational target for each activity, the methods used, as well as a schedule for the proposed lab activity. Another set of material addresses the students' part,



Figure 32 A sample page from the booklet

CHAPTER 4

GrovePi+ Demostration

STUDENTS: 1st WorkSheet Level Beginner Introduction

1: Connect the GrovePi+ to RaspberryPi (hook into the GPIO port) according to the following image (image 1).



Image 1: Grove Pi Image 2: Rasbery Pi

2: Connect the LCD screen and the button with the GrovePi+, according to the label "Screen" and "Button" respectively (see image 2), using the two cables.

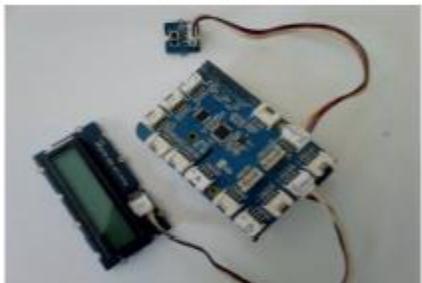


Image 3: Connection LCD monitor and Button

3: Connect the Raspberry Pi with the keyboard, the mouse (USB Port) and the screen using the Adaptor HDMI to VGA. Moreover, connect the power supply to the micro USB port and then plug it into the electrical socket. Wait for the interface to appear, then be sure that appears a confirmation message in the top right corner.



Image 4: Interface with the confirmation message to the right and the Geany icon to the left

Main Concepts – Keywords:

Raspberry Pi, GrovePi+, Monitor LCD, Button, Bronchus, Automation.

Laboratory Equipment - Preparation

- Raspberry Pi
- GrovePi+
- Monitor LCD
- Button
- Adaptor HDMI to VGA
- Power Supply

Figure 33 The first page from the student handout of one of the Lab Kit's activities

Circuit Elements

STUDENTS: 2nd WorkSheet Level Beginner Introduction

- 1:** Connect the GrovePi+ to RaspberryPi (hook into the GPIO port). Connect the Raspberry Pi with the keyboard, the mouse (USB port) and the screen (HDMI port) and turn it on by plugging it into the power cord.
- 2:** Use the conductive ink (pen) and draw the circuits on the schematic you were given (image 1).
- 3:** Place the schematic on the metal surface (image 1) and apply the LEDs to the appropriate positions, then the resistor and finally the "Switch" following the colors of the schematic. Using the two terminals and a resistor of 470K Ohm (yellow, purple, yellow), connect in the proper way the right part of the schematic.
- 4:** Place the magnetic connectors corresponding with colors, the magnetic connectors with the white color correspond to the white foursquare and the magnetic connectors with the yellow color correspond with the yellow foursquare. After that, place the "Switch" terminals in the right part of the schematic matching the colors at the top in the right way (the cables with three magnetic red, black, yellow).

Main Concepts – Keywords:

Raspberry Pi, GrovePi+, electroniks LED, Switch, Resistor, Conductive ink, Initialize, Automation.

Laboratory Equipment - Preparation

- Raspberry Pi
- GrovePi+
- Electroniks LED (2)
- Adaptor HDMI to VGA
- Power Supply
- Metal Surface
- Conductive ink
- Schematic
- Electroniks Switch
- Electroniks Connector with resistor
- Two terminal Cables (2)
- Tree terminal Cables (1)

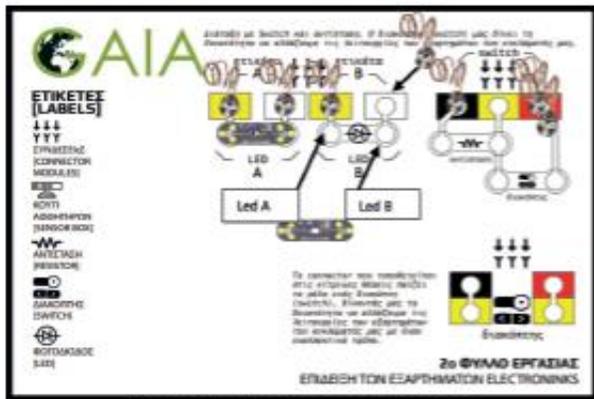


Image 1: Example of fitting parts Electroniks.

Figure 34 Another sample page from the Lab Kit booklet

Dissemination of the booklets

Regarding the actual dissemination of the booklets in the months following the completion of the project, the following paths are available to the consortium:

- The Greek School Network, available to CTI through its role as an official advisor to the Greek Ministry of Educational Affairs. This includes a large number of schools and several thousands of educators. CTI has also access on online repositories of educational material and software that are promoted towards this educational community.
- EA's network of collaborations in Greece and across Europe with other educational organizations. EA also regularly organizes events for educators' training in novel education-related technologies, which can be an additional means of promoting the booklets and the GAIA educational material.
- The Scientix community is another means for dissemination the booklets, identified early on by the GAIA consortium. We have already established an online presence and links to this community and we will make the booklets and the lab kit material available through this community as well.
- OVOS has established a network of collaborations in the German-speaking parts of Europe. We will directly disseminate our educational material through these avenues, having already raised awareness about the project and its findings.
- Finally, the material will be available on the project website, while the respective code for the activities will be available on the GitHub repository of the project.

Through this set of different means, we will ensure the continued availability of the material long after the project ends.

10. Future Dissemination Activities – After the project ends

The consortium members are continuing to invest efforts in actively disseminating the results of the GAIA project, and have already planned a number of initiatives in the months following the completion of the project. We will continue our participation in events taking place in Europe (Brussels, Vienna, Athens, Rome, Florence), as we now have products to share and will have concrete results to disseminate in order to reach our intended stakeholders. Also, the synergy activities within cluster events with other H2020 projects is exciting and heavily promoted by the EU. The consortium members also plan to undertake joint activities with local government bodies, e.g., with the Prefecture of Western Greece, through initiatives focused on energy efficiency and monitoring of public buildings.

iCities 2019 Conference

Date and place	18-20 September, 2019, Pisa, Italy
Number of attendees (estimated)	>100
URL	http://icities2019.unipi.it

Members of the consortium participate in the organization to the iCities 2019 Conference, to be held in Pisa, 18-20 September, 2019. The conference, at its fifth edition, is an opportunity for people from academia, industries, and public institutions to meet and define new collaborations in the perspective of forthcoming national or international project calls. In this respect, it is not intended to disseminate theoretical scientific activities. Instead, its main goal is to present available innovative solutions and active research projects, as well as novel ideas for new project proposals. We expect contributions in all the fields related to ICT-based solutions for smart cities and communities. The consortium is currently preparing to submit a contribution (extended abstract, deadline 4 June 2018).

Aml - BRAINS workshop

Date and place	13-15 November, 2019, Rome, Italy
Number of attendees (estimated)	>150
URL	https://ami2019.diag.uniroma1.it/

Aml2019 will be held in Rome, Italy at the Sapienza University of Rome on 13-15 November, 2019. Aml2019 will provide a meeting point for each of these communities, aiming for intensive networking and scientific debate, and shaping visions of the future. This year's event focus topic is "Data-driven Ambient Intelligence" that follows the vision of Calm Technology, where technology is useful but does not demand our full attention or interfere with our usual behavior and activities. Members of the consortium will participate in the organization of a relevant workshop in the context of the conference, similar to the previous conference held in Larnaca in 2018.

IISA 2019

Date and place	15-17 July, 2019, Patras, Greece
Number of attendees (estimated)	>100
URL	http://iisa2019.upatras.gr/

IISA-2019 is the tenth conference in the IISA series, technically co-sponsored by IEEE, the University of Piraeus, the University of Patras and the Technological Educational Institute of the Western Greece. The conference is intended as an international forum for researchers and professionals in all areas of Information, Intelligence, Systems and Applications. We invite submissions of papers presenting high-quality original research and developments for the conference tracks listed below. The conference will last for three days and will feature tutorials, technical paper presentations, workshops, and distinguished keynote speeches. Members of the consortium have made submissions to the conference, which are currently under review, while there is also a separate track for presenting results from recent and ongoing research project, in which GAIA has also submitted an abstract. IISA-2019 Proceedings will be published by IEEE.

European Research and Innovation Days/ Science is Wonderful Exhibition

Date and place	September 24-26, 2019, Brussels
Number of attendees (estimated)	Several thousands
URL	https://ec.europa.eu/info/research-and-innovation/events/upcoming-events/european-research-and-innovation-days_en

European Research and Innovation Days bring together world leaders from industry, finance, academia and business to debate and shape the future research and innovation landscape. It also seeks to mobilize EU citizens and increase general awareness and understanding of how important research and innovation are in addressing societal challenges. The consortium has submitted an application to participate in the coming 2019 edition of the event.

11. Conclusions

Concluding this document, GAIA in period following the end of the second year of the project has managed the following:

- We created a number of high-quality videos and updated existing dissemination material, in order to reflect the goals and results for the final period of the project.
- Steadily increased and improved the project's online presence, across multiple channels and especially through popular social networking platforms, expanding our reach and disseminating directly the results from the pilot activities taking place in schools.
- Organized and participated at a large number of events and activities, engaging with both the educational and the research community, thus maintaining and increasing the project's momentum in this respect.
- Submit a number of papers to important relevant scientific conferences and journals that have created additional dissemination channels for us to the research community.

In the final months of the project, we have utilized the effort invested in carrying out the pilot activities of the project and the respective results, in order to produce educational material. This material has been revised and updated continuously during the trial activities of the project, resulting in a production-ready material that has been enhanced in order to be released as 2 booklets.

Regarding the period following the end of the project, several of the consortium members will continue their efforts regarding dissemination by:

- Having a more focused approach towards the educational community, utilizing the set of educational material produced in the final phase of the project.
- Continuing to update the social networks utilized in the project, in order to keep the community formed by the project active in the near future.
- Organizing additional related events, such as scientific workshops, in order to further disseminate the results of the project.

The consortium will also continue investing into activities that will enable the sustainability of the infrastructure of the project, as well as that of the application suite produced by GAIA partners, in order to continue making such aspects available to the community after the project's end. This aspect has been communicated to the schools participating in the project, and there is a broad consensus among the GAIA community that GAIA activities will continue in the following school year (2019-20) as well.