





TECHNOPOLIS CITY OF ATHENS











Digital Fabrication and Maker Movement in Education Making Computer – supported Artefacts from Scratch

Deliverable D6.5

eCraft2Learn STEAM Certification Guidebook



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EXECUTIVE SUMMARY

This deliverable D6.5 focuses on providing guidance on obtaining training and certification on the eCraft2Learn learning ecosystem. The work described in this deliverable investigates the proper protocols needed to set up formal channels of STEAM certification of teachers interested in taking part in training on the eCraft2Learn methodology. Accordingly, a formal certification process supervised by governmental bodies was investigated in Finland and Greece, the pilot countries of the project. Furthermore, digital badges are also presented as a suitable mechanism to offer acknowledgement of self-training beyond the eCraft2Learn action lifecycle.



1 INTRODUCTION

This document introduces the training certification process that has been developed within the eCraft2Learn action. The idea of the certification is to provide the trained teachers with a document that indicates their participation in training activities of, and proficiency in aspects related to the eCraft2Learn learning ecosystem and its practical implementation in formal and/or informal settings. Hence, the certification of the teachers' training offered during the eCraft2Learn action demonstrate also the teachers proficiency in practically implementing the craft- and project-based STEAM learning methodology of the project with their students.

For the certification, the training program of the teachers is carried out so that new (or updated) knowledge, skills and abilities are obtained for bringing digital fabrication and making into the educational arena through the proposed pedagogical framework. The certification, hence, confers a credential to the trained teachers indicating that the holder has met a specific standard in terms of demonstrating the acquired knowledge, skills and abilities during the training.

In agreement with best practices, the training program of the eCraft2Learn action was devised based on an understanding of the type of teaching practices that are generally carried out in schools (i.e., traditional pedagogical approaches with teachers at the centre of the learning experience) and the knowledge, skills and abilities needed to steering the current teaching practices towards a craft- and project-based pedagogical approach (i.e., teachers as coaches of the learning experience, students at the centre of activities). Hence, the training program encompassed two parts. One part involved a face-to-face training intervention where the teachers participated in hands-on lectures and workshops on pedagogical and technical aspects of the eCraft2Learn learning ecosystem. The other part saw a contextual implementation of the acquired knowledge in order to concretise skills and practice the abilities to implement the eCraft2Learn learning ecosystem in their school or afterschool activities.

This document presents the aspects of the training program that need to be taken into account so that the certification offered the trainee demonstrates the person's proficiency in working with the eCraft2Learn learning ecosystem craft- and project-based pedagogical approach and digital fabrication tools as envisioned by the eCraft2Learn action. The document also describes the certification procedure that took place during the eCraft2Learn action and the current practices for official training certification in Finland and Greece. Furthermore, the deliverable also shows the proposed procedure of using digital badges for acknowledging the learning, self-training and self-evaluation of interested individuals. This work aims at contributing to the widespread intake of the eCraft2Learn learning ecosystem.

2 TRAINING PROGRAM ASPECTS

The training program of the eCraft2Learn action involved the familiarisation of the teachers with the pedagogical and technical aspects of the project (i.e., pedagogical core and technical core) as well as the implementation of the acquired knowledge, skills and abilities in practice in the classroom with students. During the practical teacher-training program, emphasis was made to prepare the teachers to fulfil their role as coaches, scaffolders and facilitators of the learning experience of the students within the eCraft2Learn learning ecosystem. Under this consideration, the training program covered the aspects of developing the knowledge, skills and abilities of the teachers to successfully implement the eCraft2Learn learning ecosystem. Although these 3 aspects are quite interrelated and a clear distinction is difficult to draw, for clarity we present here these aspect separated as *knowledge* of the pedagogical aspects, *skills* on the use of digital fabrication technology in education and *ability* to integrate and deploy the learnt knowledge and skill in the classroom.

2.1. KNOWLEDGE (PEDAGOGICAL ASPECTS)

The training assumed the knowledge base¹ of the teachers to be in line with current traditional teaching practices, where the teacher is the predominant actor in the classroom. The training did not disregard the knowledge of the teaching on implementing hands-on constructivist practices with their students, however. Nevertheless, the training was designed so that a practical capacity building to facilitate the trainee understanding of the eCraft2Learn learning ecosystem was provided. The training aimed at furthering, updating or improving teachers' knowledge of the following topics:

- role of the teacher as a coach,
- personalised and adaptive learning through craft- and project-based pedagogical approach: ideation, planning, creation, programming, sharing
- technologies in education
- self-regulated learning
- collaboration and teamwork
- problem-solving and creativity
- digital fabrication and maker culture in education

2.2. SKILLS (TECHNICAL ASPECTS)

We see skills as the learnt expertise of the teachers². The training assumed that the skills of the teachers in terms of the application of digital fabrication and DIY electronics tools manipulation was minimal. Therefore, the training aimed at fostering the teachers' skills development on such manipulations through hands-on familiarisation with the eCraft2Learn technical core, the unified user

¹ Knowledge refers here to theoretical or mental understanding of a topic.

⁽see https://en.wikipedia.org/wiki/Knowledge, accessed 23.11.2018)

² See for instance <u>https://en.wikipedia.org/wiki/Skill</u> (accessed 23.11.2018)

interface (UUI) tools and the learning analytics system. The training aimed at improving and fostering the following skills:

- Setting the technical core working with Raspberry Pi microcomputer, Arduino board and 3D printers
- Managing the eCraft2Learn digital platform the UUI and its tools. Understanding how the tools facilitate the deployment of the pedagogical approach.
- Acquiring basic skills using 3D modelling and circuit simulation software Tinkercad.
- Managing 3D printing slicer software and 3D printer
- Acquiring beginner's level programming skills using visual programming environment to interact with Arduino boards and other electronic components (e.g., sensors, LEDs, etc.)
- Managing the eCraft2Learn learning analytics system. Understanding how the system supports the teacher role as a coach
- Understanding the process of self-evaluation through the badge system

These skills were expected to mature further during the practical implementation of the pilots with students, based on the abilities of the trainee.

2.3. ABILITIES (DEPLOYMENT OF LEARNT KNOWLEDGE AND SKILLS)

A crucial aspect of the training related to the abilities of the teacher to assimilate and integrate the knowledge and skills learnt during the face-to-face training in order to practically implement them in the classroom with their students. The idea is to boost teachers' abilities to work under a nontraditional learning setting where the students are at the centre of the learning experience and the teacher is a coach, orchestrator and facilitator that scaffolds the learning process. For this to be successfully achieved, a flexible mind-set is imperative. The teacher needs to become comfortable with their new role in the classroom and provide the students with real-time constructive feedback. This can be done for instance by posing questions to students on how they have been working and what they have accomplished regarding their goals and objectives or by asking students to explain the choices they have made along the way. The teacher's ability to integrate knowledge and skills gained during the face-to-face training could help them to become more confident in their new role as coaches. Under this new role, it is important to help students to self-monitor, self-evaluate and self-reflect on their own learning in order to assist them to understand that the way of working they have chosen will lead to certain results. In this way, students are supported to become more selfregulated and in charge of their own learning processes. The abilities of the trainees to put the knowledge and skills in practice were then further developed during the pilots with the students, where the students under the eCraft2Learn learning ecosystem developed computed-supported artefacts.

3 CERTIFICATION PROCESS

The certification process that has been used during the eCraft2Learn action is described here. We also put forward a plausible semi-automated mechanism for future certification of teachers and other interested individuals in learning about and implementing the eCraft2Learn methodology.

3.1. CERTIFICATION PROCEDURE DURING ECRAFT2LEARN ACTION

The certification procedure that was put in place during the eCraft2Learn action follows the scheme describe in Figure 1.



Figure 1. eCraft2Learn action certification process during the project

The certification of the training program of the eCraft2Learn action comprised two main aspects:

- the face to face training where the teachers acquired and shared knowledge and skills related to the eCraft2Learn learning ecosystem and its components, and
- the practical implementation in their working environments of the learnt knowledge and skills.

The training aspect aimed at boosting the teachers' knowledge base and skills in terms of STEAM education and digital fabrication tools, whereas the practical implementation also fostered the teachers' abilities to deploy the eCraft2Learn learning ecosystem in their classrooms or after-school activities with students. The face to face training was developed in line with the established protocols of the project (D5.1) as well as under the scrutiny of interdisciplinary, established and experienced researchers from the partners institutions participating in the eCraft2Learn action (UEF, EDUMOTIVA, ULTIMAKER, ARD). Furthermore, the face-to-face training program also took into account the direct needs of the teachers and the schedule was dynamically adjusted according to the teachers' expectations. This ensured optimal results during the practical implementation part, as the teachers were more confident on the aspects of craft- and project-based pedagogy as well as digital fabrication and making technologies that they were integrating into their classrooms. During the practical pilot implementation, the teachers kept a diary where they had the opportunity to

describe and record their own progress and development as a coach (see D5.4 analysis of data). The teachers had also the opportunity to discuss and interact with project researchers, designers, developers and other participating teachers regarding technology and pedagogy issues when introducing them to their subject matter development with students.

During the pilots' implementation, the teachers were able to self-evaluate their own progress towards becoming a coach or facilitator in the classroom as well as the knowledge, skills and abilities gained during the entire process. After the pilots, the teachers were awarded a certification document (see template in Annex I) indicating the length of the face-to-face training, the main topics covered in the training as well as the length of the practical implementation. The project coordination and the local partner organiser of the training signed the certificate.

3.2. CERTIFICATION PROCEDURE AFTER ECRAFT2LEARN ACTION

The eCraft2Learn consortium has explored the possibility to create a sustainable certification process to be implemented after the eCraft2Learn action. The possibility for this process to be carried out by the piloting partners UEF, EDUMOTIVA, and TECHNOPOLIS COA was investigated. The stakeholders that were considered to take part in this process are the public or private sector authorities that certify the training program, the institutions that offer the training (e.g., universities, educational SMEs, etc.), the institutions that offer the certification to trainers and trainees (e.g., might be the same body as training institution), as well as the trainers and the trainees themselves. Here we present the outcomes of the exploratory analysis in the context of Finland and Greece. We also present the Open Badges platform as an alternative for certifying through badges the self-training and self-evaluation of interested individuals.

Finland

In Finland, UEF investigated the possibility of integrating the eCraft2Learn face-to-face training as part of the in-service teachers' training activities in a formal manner. That is, in Finland in-service teachers have every year 3 days (or 18 hours) of mandatory training in areas of their personal development³; UEF looked into the possibility of formally establishing the eCraft2Learn training as a formal part of the in-service training of the teachers and providing formal certification for this.

Discussing this issue with the External Experts Advisory Board of the eCraft2Learn project, Dr. Mikko Vesisenaho, Jyväskylä University, pointed out that in Finland there was no systematic mechanism for giving an official certificate to acknowledge achievement but that each higher education institution (HEI) such as an university is capable of offering certificates of the training they provide. Information

³ "Peruskoulun, lukion ja aikuislukion toistaiseksi otetulla opettajalla ja vähintään lukuvuoden työajaksi otetulla määräaikaisella opettajalla on velvollisuus osallistua lukuvuoden aikana kolmeen kuusi tuntia (yhteensä 18 tuntia) kestävään suunnittelu- ja koulutustyöpäivään eli ns. veso-päivään." (The Trade Union of Education in Finland, OAJ) https://docplayer.fi/46516987-Kiky-yhteissuunnittelutyoaika-vesot-yleissivistava-opetus-kaikki-sopimusalat.html

regarding the scope of the training, the number our hours and/or credit (ECTs) units should also be provided in the certificate.

Continuing this line of inquiry, we contacted the Finnish Ministry of Education and Culture about the process to create a formal training certification issued by the University of Eastern Finland (UEF). It was understood that this was not possible as there is no formal certification procedure for teacher training at a national level. Furthermore, there does not exist an institution from the public or private sector authorities in Finland that oversees the in-service teacher training and certification. The individual higher education institutions (HEIs) offering teacher education are responsible for the implementation of the national curriculum and offering training to pre-service teachers. The same HEIs could also offer training to in-service teachers in areas that they deem important to update the teacher's knowledge, skills and abilities in practice. The answer was provided by Mrs. Armi Mikkola, Counsellor of Education appointed by the President of Finland and highly valued in the Finnish education field (see Annex I). It was also understood that the UEF, as a university, is capable of endorsing a certification given to the teachers after a training course such as the eCraft2Learn training provided, and this does not need to be part of a national certification scheme. This, in fact, gives formal value in Finland to the certificates given to the teachers that participated in the training and piloting activities during the project. After the project lifecycle, teachers and practitioners in Finland would be able to self-train using the created teacher resources of the project (D6.6 Exploitation strategy documentation) and acquire Open Badges (see description below) in recognition of their achievements.

Greece

The certification procedures that are available currently in Greece offer several pathways, yet each of them has its restrictions (see Annex II). The Institute of Educational Policy, IEP (iep.edu.gr), is responsible for the in-service training of public school teachers. In the current legislation it is not included any certification procedure for private sector institutions that provide training in the context of non-formal education. The National Centre of Public Administration and Local Governance (NCPALG - EKDDA – www.ekdd.gr) is responsible for the training programs of all public servants, including teachers. A certification procedure, although restricted, is of high demand by public servant teachers because it offers certification points that count within Greek Public Sector for better work opportunities.

The next option is the certification of the methodology and, in consequence, the certification of trainers provided through the National Organization for the Certification of Qualifications & Vocational Guidance (EOPPEP). In June 2018, it has been officially announced that the General Secretariat for Lifelong Learning and Youth (GSLLY) is now the legal authority in charge of such certification based on the relevant law of 12/6/2018. This is an important certification addressed to all teachers and trainers and it could be the most convenient when it comes to non-formal

education, yet will take time before all governmental transition procedures have been completed before EDUMOTIVA and/or TECHNOPOLIS COA can apply for formal certification of the eCraft2Learn training through it.

Taking into account the current situation, the above mentioned certification options are not suitable for immediate application. The option, through IEP is not applicable to private sector. The second is applicable only for public service teachers and should be supported by a public sector body. The third although is the most preferable to provide a certification from an official accreditation organization it is not ready to provide such certification currently. Hence, EDUMOTIVA and TECHNOPOLIS COA will continue offering the trainings in Greece as described in the sustainability of the project exploitation strategy (D6.6). These partners will also provide a certification that comes with a detailed description of the training modules and the learning outcomes, along with a description of the tools and methodologies to be used. The certification will portrait the logo of the eCraft2Learn project and be signed by the organisations that realise the training (e.g., EDUMOTIVA, TECHNOPOLIS COA).

Digital (Open) Badges

Our review of the current STEAM learning/training certification procedures for teachers around the world (see Annex III) has pointed towards the feasibility of using digital badges as accreditation of self-training. Hence, we have been exploring the possibility to facilitate online self-training and provide acknowledgement of learning using electronic badges (e.g., via the Open Badges platform⁴). According to the Open Badges website, open badges are used to recognise achievements in any educational setting and at any stage of an individual's life as well as to recognise both accredited and non-accredited learning. The flexibility that the open badges platform offers represents therefore a suitable way to motivate teachers, regardless of their nationality, to self-train in the pedagogical and technical aspects of the eCraft2Learn ecosystem as well as its implementation in the classroom, and to earn their badges accordingly. This process is enabled through ULIMAKER's online community.

Offering digital badges for self-training represents a sustainable solution that contributes to the project widespread dissemination strategy. As a verifiable digital credential, Open Badges represent a global standard that has been widely used by many institutions and well-known learning management systems (LMSs) such as Canvas. The eCraft2Learn action is exploring the use of <u>Badgr</u>⁵, "an achievement recognition and tracking system built by <u>Concentric Sky</u> that is used to issue, organise and share Open Badges"⁶. Partner ULTIMAKER through the online community they have facilitated for the eCraft2Learn action will administer the electronic badges.

⁴ <u>https://openbadges.org/</u>

⁵ <u>https://badgr.com/</u>

⁶ <u>https://www.prnewswire.com/news-releases/canvas-announces-badges-powered-by-badgr-for-all-canvas-users-</u> 300684498.html

The face-to-face training program aspects of the eCraft2Learn action will be reflected also through the completion of tasks and the trainee self-assessment of knowledge, skills and abilities to earn their eCraft2Learn badge covering the following areas:

- Pedagogical aspects of eCraft2Learn learning ecosystem
- eCraft2Learn digital platform tools and support
- Implementing your knowledge in practice

Checklists to support the self-training and self-evaluation have been drafted (see Annex IV). Training and support materials are provided to the trainees via the project website (https://project.ecraft2learn.eu/) as well as the digital platform (teacher's interface https://ecraft2learn.github.io/learning-analytics/) of the eCraft2Learn learning environment. In order to get their badge, trainees will need to present their outcomes and experiences in a short report. This report could also be used and published as eCraft2Learn (Best) Practices through the CREATE Connect eCraft2Learn Community Group. ULTIMAKER, as a partner continuing the sustainability of the project, will evaluate the report and will award the official eCraft2Learn badge to the trainee via their profile in the CREATE Connect eCraft2Learn Community Group.

4 CONCLUSION

This document presented the certification procedure of the eCraft2Learn action within the life cycle of the project and beyond. The training was designed based on fostering the aspects of knowledge, skills and abilities of trainees regarding the pedagogical and technical cores of the eCraft2Learn learning ecosystem as well as to nurturing the ability to integrate the learning ecosystem in the classroom. Similarly, using digital badges, we have described a way to implement self-training utilising the produced materials and manuals during the project so that interested individuals can obtain an eCraft2Learn digital badge as accreditation after self-evaluation beyond the project lifecycle.

ANNEX I – FORMAL CERTIFICATION OPTIONS IN FINLAND

eMail correspondence with project researcher at University of Eastern Finland (UEF) 13.11.2018

Kiitokset viestistä! Suomessa ei ole mitään virallista yleistä määrittelyä tai säädöstä opettajien koulutuksesta sertifiointi- tai akkreditointimielessä. Opintojen hyväksi lukeminen ja muualla hankitun osaamisen tunnistaminen ja tunnustaminen ovat meillä yliopistojen päätösvaltaan kuuluvia asioita. Suomessa ei ole myöskään kansallista opettajankoulutuksen opetussuunnitelmaa. Suomalaiset yliopistot ovat autonomisia ja päättävät antamansa opettajankoulutuksen - niin kuin kaiken muunkin koulutuksensa - sisällöistä itse. Samoin yliopistot päättävät antamistaan todistuksista. Yliopistojen tutkintoasetuksessa (asetus794/2004, § 26) määritellään vain, mitä yliopistotutkinnosta annettavaan todistukseen tulee sisältyä. Jos joku yliopisto haluaa käyttää mainitsemaasi eCraft2Learntodistusta jossakin yhteydessä, se on kunkin yliopiston omaan päätösvaltaan kuuluva asia.

Ystävällisin terveisin

Armi Mikkola opetusneuvos Korkeakoulu- ja tiedepolitiikan osasto

Informal English translation

Thank you for your message! In Finland there is no official common definition or regulation for teacher's training or accreditation. The approval of studies and recognition of competences acquired elsewhere is a decision made by the individual universities. Furthermore, in Finland there is no a national curriculum for teacher studies. The Finnish universities are autonomous and decide on the content of their teacher education - just like any other training - themselves. Similarly, the universities decide issuing certification. The University Degree Regulation (*asetus794/2004*, § *26*) only defines what a university degree certificate should include. If a university wants to issue an eCraft2Learn certification as you mentioned, it is a matter for the university to decide.

With kind regards,

Armi Mikkola Counsellor of Education Department of Higher Education and Science Policy

ANNEX II – FORMAL CERTIFICATION OPTIONS IN GREECE

As far as the in service training in Greece, public teachers have various opportunities. The training in educational matters is a responsibility of Institute of Educational Policy (iep.edu.gr). The aims and responsibilities of IEP include teacher initial and in-service training, teaching staff selection, scholarship programs, evaluation of the administrative and educational structures of primary and secondary education, operation of Greek schools abroad, education of expatriate Greeks, immigrants and refugees as well as intercultural education, primary, secondary and post-secondary education teacher training, training and certification policy of the training agencies. The IEP also designs the national strategy on teacher training and monitors its implementation in accordance with its responsibilities.

IEP has a special scientific department that designs each teachers' educational in-service intervention. The principal responsibilities of the Teacher Training Office involve planning the national strategy for teacher training and education and monitoring its implementation as well as submitting proposals to, and cooperating with, other relevant government ministries and international organizations to design and implement teacher training and education schemes. The Teacher Training Office also issues opinions on the distribution of national and community resources available for teacher education and teacher training proposals submitted to the Ministry of Education, Research and Religious Affairs. It also maintains trainers registries on the basis of clearly defined criteria, developing and implementing training programs and actions, conducting and / or commissioning studies and surveys related to teacher training, arranging publicity events for the promotion and dissemination of the results of various training schemes, attending to any further development and sustainability of various training schemes. Of interest to the sustainable certification process after the eCraft2Learn action is that this unit certifies training institutions, coordinating and monitoring the implementation, certification and evaluation of teacher training procedures. However, in the current legislations as well as in the unit's website there is not clear certification program for the private sector institutions (SMEs) though this route is possible.

The other organization that is responsible for teachers' education on all other non-educational issues is the National Centre of Public Administration and Local Governance (NCPALG - EKDDA – www.ekdd.gr). Through the Institute of Training (INEP), NCPALG is responsible for the training programs of all public servants. INEP and its decentralized structure in Thessaloniki (PINEPTH) is NCPALG's training unit with the mission of training both the newly appointed Public Sector employees and the already serving staff of the Public sector and the Local Government through specifically designed certified programs. INEP's training actions were completely redesigned so as to support the effective implementation of the public policies concerning the administrative reform and decentralisation, the effectiveness and transparency, the sustainable development, E-Governance, health, social policy and social solidarity. The new training design empowers NCPALG's cooperation with the public services and institutions towards the elaboration of operational training

designs, through a modern system of detecting the training needs and assessing the results of the training provided. Moreover, innovative problem solving workshops are established, substantial training decentralization is strengthened, the Trainers' Registry is redesigned so as to relate each trainer's expertise to the training programs' subjects and electronic communication is adopted for all the training services provided.

After a Ministerial Decision a Training Certification system for the employees of the Public Sector, teachers included, the Public Entities and of the Local Government has been established. It aims at improving the quality of administration and the support of legislative changes with the adoption of qualitative and objective evaluation criteria for the training structures, the training programs, as well as for the knowledge and skills of the PA and Local Government HR. The certification of a training program is conducted by the Central Certification Committee, an independent body presided by NCPALG's Secretary General, after the Training Program's Design File and its accompanying sub-files are submitted by the institution interested to NCPALG's Independent Department of Certification, Quality Management and Internal Audit. A Ministerial Decision adopted a modern system of certification of training through the establishment of qualitative and objective criteria for evaluation of educational structures, training programs, as well as the knowledge and skills of the human resources serving in public services, Legal Entities of Public Law and Local Authorities and b grade.

Currently in Greece, the procedure to certify the skills and knowledge that a training program offers requires to first certifying the program and the institution providing it, after which the program is accepted to certify trainees. In case that a public sector institution wishes to certify a training program, it has to follow the procedure through NCPALG. This certification is carried out by a Central Certification Committee (KEP), an independent body chaired by the President of the NCPALG, following the electronic submission of a request from the interested institution and the completion of the design file with the accompanying documents, in accordance with the attached application guide (<u>http://www.ekdd.gr/ekdda/files/mitroo/Odigos_Efarmogis_2011.pdf</u>). To date more than 500 Titles of Public Sector Training Programs have been certified by the KEP. Each certified program regardless its length, offers 5 certification points to the participant trainee after a small certification test that performed at the end of each training program by the organisation that materialise the training program.

In addition to the above mentioned procedure IEP implements exclusively for public sector teachers programs⁷ that are materialised by each own forces or with external training experts. The training strategy is internal and is made and decided by IEP exclusively. There is not a procedure for a private sector institution to make any intervention that is not included in IPEs' strategy. The last option is about how to certify a structure, program and trainees. Initially EOPEPP (<u>http://www.eoppep.gr</u>) was responsible for this task, but after 1st of September 2018 the General Secretariat for Lifelong

⁷ <u>http://iep.edu.gr/el/epimorfosi?view=article&id=27</u>

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Learning and Youth has been taken the authority⁸ based on the relevant law of 12/6/2018 (<u>http://www.gsae.edu.gr/el/idiotika-kdvm</u>). We have to point out that in the website of GSLLY refers that according to Law No. 4547/2018 (FEK 102 Issue A), Art. 89, par. 1a, license for institutions of type 1 and 2 is granted to natural persons, legal persons, associations of persons and legal entities governed by public law by decision of the General / Sectoral Secretary for Lifelong Learning, which is published in the Governmental Printing Authority for Laws.

⁸ <u>http://www.eoppep.gr/index.php/en/structure-and-program-certification/kdvm1</u>

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ANNEX III – REVIEW OF EXISTING STEAM CERTIFICATION PROCESSES

Organisation/program for STEAM certification	Idea in a nutshell	Procedure for STEAM certification	Area of operation	Cost
ABET <u>http://www.abet.org</u>	"ABET is a nonprofit, non-governmental organization that accredits college and university programs in applied and natural science, computing, engineering and engineering technology. At ABET our purpose is to assure confidence in university programs in STEM (science, technology, engineering and mathematics) disciplines. " Accreditation for a university program, not for individuals such as individual teachers completing a training.	 18-month, 5-step process. 1 Readiness Review 2 Request for Evaluation 3 Self-Study Report 4 On-Site Visit 5 Accreditation decision 	Accreditation review outside the U.S. will only be conducted with explicit permission from all applicable national education authorities in that program's country or region.	Very expensive
Open badges <u>https://openbadges.org</u>	"Open Badges provide portable and verifiable information about skills and achievements. Individuals can unlock opportunities by sharing collections of badges representing desired skill sets in a dynamic, evidence-based way. Open Badges represent legitimate, authenticated achievements, described within badge and linked to the awarding organization. Open Badges provide a flexible way to recognize learning wherever it happens, in and out of formal education and the workplace."	Any individual or organization can create an Issuer profile and begin defining and issuing Open Badges. Any entity that can be described with a name, description, URL, image, and email address is a possible candidate to become an Issuer. To issue Open Badges you need a technology platform that supports the Open Badges Specification. The process of creating a badge typically involves three tasks: - Offering a learning or other experience (often with an associated assessment)- Creating a badge to represent that experience within the Open Badges framework - Awarding the badge on successful completion of badge criteria	Worldwide online	Free

Organisation/program for STEAM certification	Idea in a nutshell	Procedure for STEAM certification	Area of operation	Cost
AdvancED STEM Certification https://www.advanc- ed.org/services/stem- certification	"AdvancED's STEM Certification provides institutions as well as programs within institutions a research-based framework and criteria for their awareness, continuous improvement and assessment of the quality, rigor and substance of their STEM educational programs. The Standard and Indicators clearly define the qualities and components vital to creating and sustaining superior, student- centered K-12 STEM teaching and learning programs, as well as clear expectations for student outcomes and mastery of 21st century skills."	The process for earning AdvancED STEM Certification: - Use the STEM Self-Assessment to determine the current status of your school's STEM program Review the AdvancED STEM Standard and Indicators for program alignment Complete the AdvancED Improvement Network Membership Form, adding Certifications Enroll in the STEM Resource for Schools online course through a link that will be provided to your primary contact Schedule the STEM Certification Review with AdvancED Evaluate your STEM institution or program by completing the STEM Self Assessment Provide the evidence gathered to substantiate the Self Assessment rating for each Indicator. - Complete and submit the required diagnostics: • STEM Self Assessment and presentation of evidence • Two Executive Summary Questions • Standard Narrative Question Schools must be members of the AdvancED Improvement Network (AIN) in order to apply for STEM Certification and; Schools must have been implementing STEM school-wide or a STEM program within a school for at least two years prior to application for STEM Certification. The STEM Certification is valid for 5 years.	United States, Saudi Arabia, Vietnam (may be also available in other countries?)	Unknown

Organisation/program for STEAM certification	Idea in a nutshell	Procedure for STEAM certification	Area of operation	Cost
The National Certificate for STEM teaching (NCST) <u>http://nise.institute/philo</u> <u>sophy-and-design.php</u>	"Certifies STEM professionals (teachers, campuses and districts) in STEM education. STEM teaching uses a competency-based, academic coach led online learning platform and guides teachers through the development of a portfolio that demonstrates proficiency across 15 teacher actions essential to STEM learning. Because the certificate is competency-based, skilled teachers do not need to "sit through content" they already comprehend. Rather they are invited to demonstrate proficiency through their portfolio, self-evaluation, documentation, and examinations of student work ."	Guiding principles for the NCST: Student autonomy, constructivism, explicit/reflective methodology, 21st century skill building Criteria for STEM teaching with 15 specific actions that are organised into three domains. They are Creating an Environment for Learning, Building Scientific Understanding, and Engaging Students in Science and Engineering Practices. Further, these actions are themselves broken down into thirty-nine indicators that form the basic structure of the certificate program .	United States	625 dollars
Cambridge College https://www.cambridgeco llege.edu/degree/stem- certificate-science- technology-engineering- and-mathematics	"The STEM Certificate in Science, Technology, Engineering and Mathematics provides early childhood, elementary, special education and middle school educators with the core background skills and content knowledge necessary to become highly-qualified mathematics, science and engineering educators serving our younger students."	The courses combine math, science and engineering content with methodology at the elementary and middle school levels. The 12 graduate credits include both seated and online courses. After completion of the courses, the certificate is given.	Cambridge College, United States	554 dollars (cost per credit hour)

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Organisation/program for STEAM certification	Idea in a nutshell	Procedure for STEAM certification	Area of operation	Cost
STEM / STEAM Georgia http://www.stemgeorgia. org	"The Georgia Department of Education is proud to offer STEM and STEAM Certification to recognize schools that have implemented a culture of innovation, interdisciplinary instruction, and business and community partnerships. Schools have a choice between two models for certification: Whole school or Program. Program certification indicates that the school has selected a group of students to participate in their STEM or STEAM programs. All STEM and STEAM schools have the opportunity reapply for certification every five years."	 STEP 1: LEARN ABOUT STEM/STEAM The Georgia Department of Education utilizes Continuum documents to determine school or program readiness for certification. STEP 2: VISIT CERTIFIED SCHOOL Administrators and educators involved in the STEAM process are encouraged to visit DOE Certified STEAM Schools. STEP 3: IMPLEMENT FOR TWO YEARS STEM or STEAM Certification takes time. This process involves a shift in pedagogy, school culture, and instruction. STEP 4: COMPLETE SELF-ASSESMENT Utilize a self-assessments below along with the continuum document to determine if your school is ready for a Department of Education STEP 5: SCHEDULE A PRE-VISIT: During the pre-visit, a STEAM Program specialist will determine whether you have met the criteria to apply for STEAM Certification. Additional pre-visits may be required. STEP 6: ADJUSTMENTS AND CONTINUED GROWTH: Following the pre-visit, make adjustments recommended by the STEM/ STEAM Program Specialist. STEP 7: COMPLETE THE APPLICATION: When recommended by a STEAM application. At this time, a site visit for certification will be 	Georgia, United States	Unknown

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Organisation/program for STEAM certification	Idea in a nutshell	Procedure for STEAM certification	Area of operation	Cost
		scheduled. STEP 8- SITE VISIT: The certification site visit will consist of representatives from math, science, CTAE, fine arts, technology, and business. The site visit will include classroom visits and a panel of business/ community partners and student caregivers. The visiting team will compare observations with in-person evidence. STEP 9: CERTIFICATION: If recommended for certification, an award ceremony will be scheduled where the DOE will present the school a banner from the State School Superintendent or one of his Deputies.		

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Organisation/program for STEAM certification	Idea in a nutshell	Procedure for STEAM certification	Area of operation	Cost
Global STEM Alliance, The New York Academy of Sciences - STEM Certification https://www.nyas.org/pro grams/global-stem- alliance/stem- certification/?tab=stem%2 Ocertification	The STEM Certification Program facilitates selection of high-quality STEM materials for the education sector by reviewing and certifying materials that align with our STEM Education Framework.	 Submit materials for review. Any curriculum, set of instructional materials, educational program, or product intended for formal or informal STEM learning may be reviewed, including instructional software, online courses, educational games, apps, and professional development resources. Reviews conducted by independent experts. All reviews are performed by a panel of experts with advanced degrees and deep knowledge related to the subject matter, grade level, and intended audience of the materials under review. Receive actionable feedback. Each review concludes with a detailed report of how the materials align to each element of the framework. Receive GSA Certification. Materials that align to the framework receive official certification from the New York Academy of Sciences' Global STEM Alliance, an initiative designed to advance STEM education worldwide. 	Worldwide	Unknown

ANNEX IV – CHECKLIST DRAFT TEMPLATE FOR SELF-TRAINING AND SELF-EVALUATION

Union's Horizon 2020 Research and Innovation Experience under Grant Agreement No. 73 1345.

eCraft2Learn 🚓

Open Badges - Self-evaluation

Pedagogical aspects of the eCraft2Learn learning environment I have understood the competence criteria below and can self-report to meet them

Knowledge (mental or theoretical understanding)

- □ I can explain what STEAM education stands for and how it relates to the eCraft2Learn approach
- □ I have familiarised with the craft- and project-based learning/teaching approach to STEAM learning of the eCraft2Learn learning environment
- □ I have familiarised with how to support students' work when developing computer-supported artefacts within the eCraft2Learn learning environment
- □ I understand the importance and value of student collaboration and teamwork in the eCraft2Learn learning ecosystem
- □ I have familiarised with the concept of changing the teacher's role to that of a coach or facilitator in the eCraft2Learn methodology
- □ I know how to support students building their personalised learning paths with self-reflection and self-regulation in relation to the eCraft2Learn methodology

Skills (learnt and practiced new behaviours that have been developed/improved)

- □ I have successfully put in practice a craft- and project-based approach to STEAM learning with my students
- $\hfill \Box$ I have successfully practiced how to encourage students to be the main actors in the classroom.
- □ I have successfully practiced how to support personalised learning paths for individual students needs
- \Box I have successfully practiced being a coach in the classroom
- Abilities (developed or improved underlined/inbuilt dispositions)
- □ I am able to implement a craft- and project-based pedagogical approach in my teaching
- □ I am able to be a coach in my classroom, putting students at the centre of the learning experience
- $\hfill\square$ I am able to support students personalised learning paths

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Open Badges - Self-evaluation

Technical aspects of the eCraft2Learn learning environment I have understood the competence criteria below and can self-report to meet them

Knowledge (mental or theoretical understanding)

- \Box I have familiarised and understood the basics of electronic circuitry
- □ I have familiarised and understood the basics of using visual programming environment (e.g., Snap!, Snap4Arduino) through the eCraft2Learn students' interface (UUI)
- \Box I have familiarised with digital fabrication tools available for 3D modelling
- \Box I have familiarised with digital fabrication tools available for 3D printing
- □ I have familiarised with the available Open Educational Resources in the digital platform, what they include and where to access them
- □ I have familiarised with the eCraft2Learn digital platform learning analytics system (teacher's interface) and how it works
- □ I have familiarised with the eCraft2Learn digital platform students' interface (UUI) and the various tools that it offers to support the craft- and project-based pedagogical approach of the eCraft2Learn learning environment
- □ I know where to access the UUI from and how students should login to the platform so that I can track student learning through the learning analytics system (teacher's interface)



This project has received funding from the European Union's Horizon 2020 Research and Innovation Receivere under Grant Agreement No. 731345. □ I have familiarised with the eCraft2Learn Educator Community (CREATE Connect) and understand its benefits in sharing and collaboration

Skills (learnt and practiced new behaviours that have been developed/improved)

- $\hfill\square$ I have successfully practiced with basic electronic circuitry
- \Box I have successfully practiced with visual programming (in the UUI)
- \Box I have successfully practiced with different kinds of DIY electronics
- □ I have successfully practiced with the learning analytics system (teacher's interface) to analyse student actions, identify possible issues, provide support for student learning and optimise the learning experience
- □ I have successfully practiced with the UUI and the different tools that are accessible through it
- □ I have successfully practiced designing a project for students within the eCraft2Learn learning environment (e.g., setting up a new section ID through the teacher's interface and using it with students in the classroom)

Abilities (developed or improved underlined/inbuilt dispositions)

- □ I am able to implement a craft- and project-based pedagogical approach in my teaching within the eCraft2Learn learning environment (e.g., using the digital platform)
- □ I am able to provide timely feedback to students with the assistance of the learning analytics system (teacher's interface)
- □ I am able to support students' self-reflection, self-regulation and selfevaluation within the eCraft2Learn learning environment





Open Badges - Self-evaluation

Implementing your knowledge in practice eCraft2Learn learning environment

I have understood the competence criteria below and can self-report to meet them

Knowledge (mental or theoretical understanding)

- □ I understand DYI electronics and digital fabrication tools available and how they can be used to support a craft- and project-based pedagogical approach in my teaching
- □ I have familiarised with different kinds of hardware, software, physical tools and materials I need to integrate eCraft2Learn learning ecosystem in my classroom
- □ I have familiarised with the eCraft2Learn digital platform (students' interface and teacher's interface)
- □ I understand the importance of collaboration and teamwork within the eCraft2Learn learning environment
- □ I understand the importance of interdisciplinary STEAM projects to enhance students learning

Skills (learnt and practiced new behaviours that have been developed/improved)

- □ I have successfully run a project realising the eCraft2Learn methodology with students
- □ I have successfully incorporated the craft- and project-based approach into my subject matter

Abilities (developed or improved underlined/inbuilt dispositions)

- □ I am able to implement a craft- and project-based pedagogical approach in my teaching within the eCraft2Learn learning environment (e.g., using the digital platform)
- □ I am able to self-evaluate and reflect upon an implemented project by finding aspects of both success and improvement



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programs under Grant Agreement No. 73 (345.