Intellectual Output 4 (IO4)

Preliminary Teacher's Guide

University of Cyprus

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1 Introduction

The pilot implementation plan deals with implementing the CONNECT approach based on the designed pedagogical framework and educational scenarios to validate their effectiveness. Teachers from EU secondary schools of the participating countries will first attend the MOOCs developed under IO3 for three (3) months. The face-to-face training in Athens will then be asked to deliver a part of the curriculum online (and in complement to the in-class activities) for a week to evaluate the proposed intervention's effectiveness.

The CONNECT pilot implementation plan includes the necessary information and activities for conducting the Piloting with samples of users that will gather recommendations and suggestions. The Piloting will be conducted with the support of teachers who possess the required expertise, knowledge and experience and are competent to provide adequate feedback about the quality and usefulness of the designed pedagogical framework and educational scenarios.

The concept of the piloting procedure includes testing the targeted users' acceptance through providing the designed pedagogical framework and educational scenarios to them with a set of assessment instruments and reporting templates. Based on the gathered recommendations and suggestions.

1.1 General Pedagogical Framework

As already mentioned, the COVID-19 pandemic has forced European schools to provide learners with emergency distance education. The school year of 2021-2022 displays new features as educators and learners have come back to class, enriched with new knowledge and skills regarding digital tools' exploitation. This new context highlights the necessity of blended learning as a practical approach to the learning process.

According to the European Commission (2021), blended learning in formal education and training is valid when a school, an educator or a learner uses more than one approach in the learning process; it is a combination of face-to-face teaching with distance learning within the school environment but also a combination of different learning tools, both digital and non-digital.

Adopting the blended learning model, the Erasmus+ CONNECT project aims to support

both secondary schools and teacher training systems to respond to the current pandemic conditions and any future educational challenges. Combining online education with face-to-face interaction is triggering for everyone, including struggling students who need additional guidance and support. It is expected that piloting blended learning - more specifically, the flipped classroom model - at partner country schools will offer valuable opportunities for exploring teaching and learning practices in the subjects of Mathematics, Physics and Foreign Languages.

In this respect, the Erasmus+ CONNECT project fosters “the inverted learning with an emphasis on hybrid model” (CONNECT, 2021), aiming at reinforcing the ability of partner country education and training institutions to provide high-quality, inclusive digital education. Thus, the pedagogical approach is expected to provide opportunities for the personal, socio-educational and professional development of the target groups involved; using innovative online resources and tools “to leave no one behind” (European Commission, 2020c) will be exploited towards this direction.

The educational scenario can be thought of as a learning unit that involves a set of activities and resources designed to support the acquisition of knowledge, skills, and attitudes by learners. It typically includes a series of steps or stages, each with its own specific objectives, methods, and outcomes.

The first stage of an educational scenario usually involves setting goals and objectives for the learning unit, which may include specific learning outcomes, performance indicators, or other criteria that will be used to assess the learners' progress. This stage may also involve identifying the target audience or learners and their existing knowledge and skill levels. The next stage typically involves designing and selecting appropriate learning resources and materials, such as textbooks, lectures, online resources, or other tools and technologies that will support the learners' acquisition of knowledge and skills. This may also involve selecting appropriate assessment methods and tools, such as exams, quizzes, projects, or other forms of evaluation. The implementation stage of the educational scenario involves delivering the learning unit to the learners, typically through a combination of teaching methods, such as lectures, discussions, group work, or independent study. This stage may also involve monitoring and tracking learners' progress, providing feedback and support, and addressing any issues or challenges that arise. The final stage of the educational scenario involves evaluating the learners' performance and

the effectiveness of the learning unit as a whole. This may involve assessing learners' knowledge and skills, analyzing the effectiveness of the learning resources and methods, and identifying areas for improvement and future development.

Overall, the educational scenario can be seen as a dynamic and iterative process that involves continuous feedback and adjustment based on the learners' needs and progress, as well as changes in the learning environment and broader educational context.

1.2 The pedagogical use of digital tools.

We live in an era of constant change regarding our world, society, students, science and technology, technological-pedagogical needs, and schools. In this school of the future, digital media will undoubtedly be of vital significance. They will play a key role in the daily teaching practice, transmitting new knowledge in terms of communication and cooperation between teachers and students and among students. Above all, as the experience of education in the period of the pandemic showed, the pedagogical use of technological tools will require the student to act as a "social user" who will need the cultivation and development of multiple skills and literacy to operate in these new digital environments successfully.

In the second part of this document, the basic principles of pedagogical utilization of technologies in education will be presented, a categorization based on their use and learning added value will be attempted, and, finally, some technological tools to be used in Mathematics, Physics and Foreign Language will be proposed.

In this light, the pedagogically oriented use of digital technologies in everyday teaching, which promotes the cultivation of multiple literacy and digital skills should play an important role in the school. According to McLoughlin & Lee (2007), the advantage of using them lies in the social use of the internet, which allows students to work in groups, encourages them to produce material and share it with their classmates, to communicate, collaborate and interact with them. Through interaction, they develop flexibility and problem-solving strategies. A new learning culture is created, characterized as social learning.

In recent years, the effort of teachers of all disciplines to enrich their teaching with multimedia, multimodal and interactive learning content is evident. The rapid

development of digital media, mainly the internet, the improvement of technological equipment in schools, the creation of digital educational repositories by educational institutions, the creation of Digital Schools and the digitization of textbooks, the mass training of teachers in the use and utilization of technologies and the "democratization" of the use of "mobile" devices by teachers and students are some of the factors that led a growing number of teachers to enrich the content of their course with online resources, digital presentations, multimedia visualizations, interactive applications etc. More and more often in recent years, teachers use digital learning resources from selected websites in their classroom and digital material that they create themselves using appropriate software and special digital applications.

The use of technological tools should not focus on the simple use of software nor on their simple integration into the educational process solely as a means of presenting new knowledge. Instead, technology must be utilized with a techno-pedagogical approach that allows the "utilization" of all these features that we can not find and use if we do not resort to it. In this sense, before using a technological tool, we should consider what it offers us in relation to using a conventional supervisory teaching tool or textbook. For example, a summary table that shows a grammatical structure on an interactive whiteboard does not add value when it is not accompanied by the use of interactive whiteboard tools, such as the "curtain", "lens", tool "drag", etc. Similarly, showing a video with some mathematical reasoning or some physics experiments or with some sights of a country with a video projector in the classroom offers limited added value compared to using the same video as "interactive" exploiting a digital application that allows the integration of interactive elements such as questions, comments, the introduction of hyperlinks, etc.

In addition, before we use any technology during a lesson delivery, we should consider why we include it in the learning process. Using one digital tool to talk about "innovation" and "modern" methodological approaches is not enough. Its use should be accompanied by the appropriate techno-pedagogical utilization to contribute to the involvement of students in the learning process, to lead them to exploration and active involvement, to make them social "users" in authentic digital learning " environments ", to give meaning to what they learn and to what they are called to" do ". And today, more easily than ever, it is possible for students to engage themselves in activities, either individually and/or in groups, where they will use their knowledge creatively. Besides, as teachers, we all know

that our students, the same way as we have experienced as students, remember:

- 10% of what they/we read
- 20% of what they hear
- 30% of what they see
- 50% of what they hear and see
- 70% of what they say while talking to others
- 90% of what they say while making something.

Today, more than ever, educational technologies enrich course contents with rich, authentic and up-to-date material. At the same time, the learning process becomes more attractive for the students, activates them to participate and facilitates differentiated learning, as, on the one hand, the multimodal texts correspond to all the learning profiles and, on the other hand, the emphasis is on the students' involvement in experiential activities, self-efficacy, autonomy and collaboration in digital environments.

In this context, such an approach to utilizing technological tools, activities such as creating a blog, wiki, concept map, a word cloud, a digital poster, visualization material, digital storytelling, quizzes, etc., as well as participation in social networks and forums, require students to use digital media, individually and/or in groups, in order to become "creators" of digital material and thus develop multiple skills (communication, digital, social, collaboration, empathy, critical ability, etc.). Digital tools should be used in education and teaching when they have added pedagogical value, not reproducing traditional practices through contemporary tools. Information and Communication Technologies should not simply focus on a software application or be limited to a substitute for the traditional teaching board. Instead, technology must be used in such a way as to support the learning process by creating an educational environment, a digital "ecosystem", in which learning events "happen". Teachers are encouraged to use digital applications in their daily teaching practice to achieve concurrent living and cross-curricular teaching goals. It is suggested that they use specific digital educational resources -from the internet- that are pedagogically appropriate for the students and classes' specific needs to further their teaching by integrating inverted classroom activities.

The use of digital technologies in the learning process can contribute significantly to

developing knowledge and skills and enriching teaching with authentic multimodal material. An important element of the pedagogical use of digital tools that should be considered is the gradual transition from "teaching through the media" to "learning through the media". In other words, in experiential, exploratory and active learning, using digital media as a supplementary means of presenting and promoting new knowledge by the teacher is not enough. What is useful for students is to use them as tools and, above all, as "environments" where the learning process takes place. In this light, emphasis should be placed on the following key ways of using digital tools in educational design:

a) The use of digital technologies by the teacher offers the possibility of exploiting rich and varied multimodal material, e.g. pictures, audio texts, videos, educational games etc. and enriches the activities. Furthermore, through a variety of digital applications, the teacher has the ability to create attractive worksheets to increase student motivation.

b) The design of activities that promote the use of digital applications by students for the implementation of the activity, the creation of material and/or the presentation of the final product contributes to the development of digital literacy, the development of students' creativity, as well as their social skills.

In conclusion, the exploitation of digital technologies in the learning process is promoted through the CONNECT Project, from its material as well as from the suggested educational scenarios. However, it is pointed out that they should not be used as an end in themselves. Instead, it is suggested that they be integrated didactically and pedagogically to take advantage of their additional benefits, such as tools for creating a concept map, clouds, digital posters, visualization material, educational games, quizzes, etc.

1.3 Formative Assessment

Modern economic, social and technological changes are impacting the processes and outcomes of learning at school, reinforcing the development of new competencies for teachers and learners and promoting a shift towards developmental and formative assessment models. Formative assessment represents a response to the limited, measurable and closed nature of evaluative assessment. The emphasis is no longer on results but on the learning processes and practices through which learning is supported and developed.

Formative assessment shifts the focus from the individual to the whole of the school's

overall educational work, and the school's self-evaluation takes on a new dimension. The importance, symbolism, and continuous improvement of the school unit become key elements in the school's development. It becomes an internal affair. The professional development of teachers takes on fundamental importance through the cultivation of new professional skills, the development of innovative educational practices and the adoption of collaborative ways of working.

Formative assessment is designed to contribute to developing and improving the educational work and learning process. Its purpose is to ensure that learning objectives are being achieved and, to what extent, to detect and identify problematic aspects and weaknesses and to guide teachers and students in making adjustments and corrective action. It is an ongoing and continuous process of It is a continuous and uninterrupted process, carried out throughout the educational process, provides feedback to teachers and students, assesses the value and impact of teaching and pedagogical choices and approaches and leads to leads to necessary modifications to improve the learning of teachers and students.

Because formative assessment is designed to guide the educational process - and is not used as an outcome indicator - it provides a secure and non-threatening evaluative framework, is considered an individualized assessment and is under the teacher's control. The philosophy of this model draws on the constructivist perspective, treating assessment as a learning process and its characteristics refer to assessment for learning.

Today, when societies are more fragmented, hybrid and fluid than in the past, when digital communication is exploding, and access to knowledge and information is unhindered, schools are being called upon to redefine their role in their new role. Formative assessment is evolving, and the new assessment is aimed at personalized and independent learning. The emphasis is shifting from the guided cultivation of competencies and the systematization of processes of educational improvement to autonomous learning, self-action and self-directed learning self-regulation. What teachers and pupils are now looking for is good teaching and learning, good learning results, the use of best practices and effective learning processes. The ultimate goal is to cultivate a reflective and autonomous learning professional educator and learner who constantly consciously chooses their learning paths, constantly reviewing, searching and changing, and who appropriate learning paths who plans and monitors their learning. In this spirit, the school's self-evaluation is complemented by self-evaluation of the teacher's learning processes and the

evaluation of the teacher's learning processes peer assessment, and the assessment of pupils makes use of self-evaluation techniques and hetero-evaluation. The philosophy behind this new shift in formative assessment adopts post structuralist thinking, conceiving of assessment as a way of the self and the construction of the individual and collective educational subject and is linked to a view of assessment as learning.

1.4 Peer-Review

The Peer Review is a structured and organized way of cooperation between the teachers to enhance and improve teaching and pedagogical practices. It is part of a broader culture of collaboration, mutual trust, and respect between teachers. In the school example, peer evaluation is not limited to an observation of teaching. Still, it is a holistic process of transformative learning and critical reflection to transform the educational subject (individual and collective).

Peer Assessment effectively strengthens learning communities in schools by sharing good practices, developing awareness and creating self-awareness about the impact of their teaching to promote changes in educational practices and enhance teachers' professional development. By peer assessment, teachers communicate, collaborate, observe and develop their practice, observe each other's practice and learn from each other. As a result, they focus on their individual needs, make the most of their potential, have the opportunity to learn from their peers and learn from each other, learn from each other's practice and provide constructive feedback to colleagues, making a substantial contribution to the collective effectiveness of the whole school. In the example of the OMC school, the Peer Review process is divided into five stages:

- The stage of self-reflection
- The stage of preparing the classroom observation
- The stage of classroom observation
- The feedback stage
- The critical reflection stage

1.5 Communities of Practice

The Communities of Practice (CoP) framework is a pedagogical approach that emphasizes the importance of social learning in developing knowledge and skills. Jean Lave and Etienne

Wenger first introduced the framework in their book "Situated Learning: Legitimate Peripheral Participation" (1991), and it has since been widely adopted in various educational contexts. According to the CoP framework, learning occurs through social participation in a community of individuals who share a common interest or practice. Three key elements characterize CoPs:

- Domain: a shared area of interest or practice that serves as the focus for the community's learning and development.
- Community: a group of individuals who share this common interest or practice and engage in ongoing interactions and collaborations to learn and develop.
- Practice: the shared repertoire of resources, tools, and methods the community uses to pursue its shared interest or practice.

In a CoP, individuals start as novices and gradually become more skilled through their participation and engagement with the community. Community members learn from each other through observation, participation, and collaboration. As individuals become more proficient in the practice, they can take on more central roles in the community and become leaders or mentors. The CoP framework has been applied in a range of educational settings, including K-12 and higher education, workplace learning, and informal learning contexts. CoPs can be facilitated through a variety of strategies, including online communities, mentorship programs, and collaborative projects. Overall, the CoP framework emphasizes the importance of social learning and collaboration in developing knowledge and skills. By creating communities of practice that support ongoing learning and development, individuals can deepen their understanding of a shared interest or practice, and develop the skills and competencies needed to succeed in that field.

1.6 The Evaluation of the Educational Project at School

Evaluation of the Educational Project (EEP) is a key dimension in the functioning of the school's operation. The transformation of the school into a 'learning community' requires a change of structures, processes, relationships and culture in the school unit based on recognizing the relative autonomy of schools and enhancing the degree of the enhancement of teachers' freedom to carry out their work. Lifelong learning is systemic and is linked to a number of interdependent systemic and interdependent factors, such as means and resources, organizational and administrative structures, educational processes

(teaching and pedagogical practices), supportive and supportive initiatives (training activities, compensatory and supporting activities, teaching and interventions, action programmes, etc.).

Lifelong learning is crucially linked to substantial changes in the culture of inter-school relations and the reform of educational practices in the school. It is an ongoing dynamic process of self-evaluation integrated into the school's functioning. It is a systematic process that includes an assessment of the existing situation in the school and is linked to the specific Action Plans to improve the quality of educational work in the areas chosen by each school according to its specificities. Consequently, the transformation of the school into an organization and learning community is based on and presupposes an expanded development of the process of self-evaluation in the school, including the teachers.

The evaluation of the educational work and learning processes in the school by teachers themselves constitutes a key dimension of their professional development. In addition, learning and development are linked to the introduction, promotion and consolidation of a 'culture of trust' based on the development of relationships of responsibility and cooperation within the school and the educational community.

1.7 Teachers' self-evaluation

Teacher self-evaluation is a key factor in improving the quality of educational work in the school. Evaluation differs in its form (external, in-school, self-evaluation), purpose (formative, evaluative/summative, final), method (quantitative, qualitative), and mode/tool (descriptive, taxonomic). The construction of the educational subject (individual and collective) is based on the evaluation process. The individual evaluation of teachers is inextricably linked with the assessment of the educational project. We cannot think about improving the individual subject without the corresponding improvement of the collective subject and vice versa. We cannot promote the self-evaluation of the school and not support the "self-evaluation" of teachers. The 'self-evaluation' of the school must support and interact with the 'self-evaluation' of teachers.

The example of the OMC school is essentially based on the function of the in-school self-evaluation (SSE) and promotes the process of teacher self-evaluation with an emphasis on the formative character of the evaluation. The 'self-evaluation' of teachers focuses on the

key parameters of the main elements of the educational work: scientific constitution, teaching and learning, pedagogical climate and relationships, quality improvement programmes and actions, and administrative work and refers to the main qualities of the teacher: scientist, professional, pedagogue, a worker with the aim of professional development and improvement of the competences of teachers. In the example of the CSO, the process of 'self-evaluation' of the teacher is not a process of 'self-assessment', but rather a process of development and improvement of the teacher's professional and educational skills cannot be limited, fragmented and self-referential, to the extent that it aims to remove isolationism and individualism. On the contrary, it must be in the context of the 'school as a whole', the collective, and the school community taking into account the learning processes, cooperative practices, the learning processes, learning practices, cooperative working practices, the parameters of the educational project and the teacher's abilities.

In addition, the self-evaluation of teachers' self-evaluation is not limited to an informal internal process within the school but is directly linked to educational and social accountability, is based on and presupposes the state's trust in teachers, and promotes and strengthens the trust of society in the school.

1.8 The evaluation of teachers' work

The teacher is a key factor in the development and quality assurance of the quality of educational work in the school unit. The evaluation of teachers' work has a declarative, formative, pedagogical, improvement and developmental character. It is directly linked to the assessment of learning processes, the improvement of the quality of educational work and the development of the quality of teaching and the professional development of teachers. The evaluation of teachers' work is based on the process of self-evaluation. The purpose of self-evaluation is not to monitor and rate teachers' performance but to evaluate the processes and quality of learning as a continuous process of enhancing teachers' professional development and improving educational work for the benefit of pupils and society. The following are considered key elements of teacher work evaluation:

1. The link between the evaluation of teachers' work and the evaluation of teachers' work in the school unit with emphasis on the processes of the linkage of the

assessment of the educational institution with the review of the school's teaching staff, with the emphasis on the processes of self-evaluation.

2. the promotion of a culture of 'self-evaluation' and the building of a 'culture of self-evaluation trust, responsibility, reciprocity and cooperation' in the school.
3. strengthening collaborative practices between teachers (teachers improving the quality of their work through collaboration with other teachers improve their performance by working with other teachers).
4. The emphasis on the production and use of educational evidence (at the individual level) (individual and collective) by the teachers themselves, thus limiting the production and use of learning materials (individual and collective). "The emphasis on the teachers themselves, thus reducing the 'power' of one-person evaluators.
5. the strengthening of teachers' professional development with emphasis on enhancing teachers' professional development with a focus on in-school training.

2 Piloting Procedure

The pilot procedure, also known as a pilot study, is a small-scale preliminary investigation conducted to evaluate the feasibility and effectiveness of the CONNECT approach. The main purpose of a pilot procedure is to apply the CONNECT approach before conducting a full-scale study. This can save time and resources and improve the validity and reliability of the results. A small sample of educators and students is recruited during a pilot procedure to apply the CONNECT approach. Data collected during the pilot is based on the flipped classroom on the specific topics of Physics, Mathematics and Foreign languages. Overall, a pilot procedure is an important step in the research process that can help ensure the success of the flipped classroom at schools.

2.1 Objectives

- Strengthening teachers' digital skills and the skills to implement innovative educational practices, such as the flipped classroom.
- Enhancing teachers' capacity to develop educational scenarios based on innovative practices such as the flipped classroom but also based on appropriate

digital interaction.

- Increasing collaboration between specialist teachers at the school level.
- Improving the learning process (increasing active participation, interactive interaction).

2.2 Guidelines for Piloting

2.2.1 General recommendations

The proposed pilot implementation plan of the CONNECT project is part of the response to lessons learned from the COVID-19 pandemic, when many pre-existing inequalities were exacerbated and brought to the fore. The pilot implementation plan will take place in all partners' countries – Cyprus, Italy and Greece. The support planning of the CONNECT pilot implementation; may also inspire long-lasting positive change for blended learning in Mathematics, Physics and Foreign Languages, embracing innovative pedagogical approaches, including assessment.

The pilot application of the approach is developed during January-March 2023. It focuses on the implementation of the teaching scenarios of Mathematics, Physics and Foreign Languages in the 3rd Lower Secondary School according to the flipped classroom model. It aims to upgrade teachers' digital skills according to the CONNECT approach and serves the professional development of teachers. In particular, in terms of content, teachers are invited to choose or prepare a teaching scenario of their specialty, which is taught according to the curriculum of each partner country during the months mentioned above. Furthermore, the partners work with the schools in their country to secure the digital tools and resources and the technological infrastructure and distance learning platforms for the students (e.g. e - class, e - me for Greece) to be used in the pilot application (see: https://e-me.edu.gr , https://eclass.sch.gr).

The preparation of the script is done collaboratively by the teachers of the same specialty of the school, and they are taught individually in the teacher's class. The following table shows the development of the pilot application during the three months of its implementation regarding the distribution of the teaching hours of the three subjects that are desired to be the subject of the teachings in the three partner countries.

In the context of pilot implementation, peer review can play an important role in ensuring the quality and effectiveness of the implementation. For example, peer review can be used to evaluate the pilot project's design, development, and implementation and identify any potential issues or areas for improvement. Peer feedback can refine and improve the pilot implementation before it is rolled out more broadly.

Communities of practice (CoPs) are groups of people who share a common interest or profession and engage in ongoing learning and collaboration. CoPs can be found in a variety of settings, including workplaces, educational institutions, and professional organizations.

In the context of pilot implementation, CoPs can play a key role by bringing together individuals with relevant expertise and experience to collaborate and share Good practices for all the topics (ANNEX I).

Pilot teachings	Conducting week	Duration of phase 1: teaching in minutes	Duration of phase 2: teaching in minutes	Duration of phase 3: teaching in minutes	Class / Lesson / Thematic unit
1					
2					
3					
4					

Table 1. Timetable & content of pilot application of Mathematics

Pilot teachings	Conducting week	Duration of phase 1: teaching in minutes	Duration of phase 2: teaching in minutes	Duration of phase 3: teaching in minutes	Class / Lesson / Thematic unit
1					
2					
3					
4					

Table 2. Timetable & content of pilot application of Physics

Pilot teachings	Conducting week	Duration of phase 1: teaching in minutes	Duration of phase 2: teaching in minutes	Duration of phase 3: teaching in minutes	Class / Lesson / Thematic unit
1					
2					
3					
4					

Table 3. Timetable & content of pilot application of Foreign Language

The development of the pilot application should ensure that teachers are sufficiently introduced to the basic features of the flipped classroom model.

2.2.2 Methodology of the pilot application

The proposed methodology mainly concerns four actions:

A. Preparation: training MOOCs, material study, ppt, LTTA, teachers ' study guide

B. Didactic transformation of the PS, a configuration of the application scenario

C. Evaluation of the pilot application.

(a) As the majority of teachers who will be involved in the pilot application participated in the LTTA, MOOC, their introduction to the expected pedagogical transformation will build on their previous educational experience based on a flipped classroom methodology. In this direction, the supporters (Coordinators, Advisors, Ambassadors) will act as critical friends and researcher-partners of teachers in investigating their teaching practice and its improvement in the direction advocated by the CONNECT approach. For this purpose, in meetings with teachers:

- They will focus on the weak characteristics of the didactic transformations observed by the Ambassadors critique but also those identified.
- They will support the design, implementation and evaluation of teaching approaches to remove the above weaknesses.
- They will feed teachers' individual and collaborative reflections regarding their pilot teaching experiments.

As for teachers who did not participate in the LTTA, MOOC, they can voluntarily participate. The launch will be pursued with the support of participating school teachers and supporters. Overall, the teacher support throughout the pilot application is in the collaborative development of teaching approaches in line with the CONNECT approach.

(b) As the pilot application concerns only a part of the daily teaching work of the teachers involved and is expected to differ significantly from it possible, it inevitably has characteristics of a teaching intervention. Therefore, every teaching intervention must adopt a specific methodology for planning, implementing and evaluating the teaching practice as well as the development of the teacher. In this direction, the methodology proposed combines collaboration (collaborative planning, cross-observation, reflective dialogue). These actions offer a clear framework for the systematic collaboration of teachers with trainers and supporters to improve specific teaching practices, such as those introduced by the CONNECT approach.

On the other hand, the actions related to the perspective of teachers' cooperation strongly encourage and support the development of teachers' teaching practice based on cooperation between them, forming a positive framework for their continuous development in the direction suggested by the approach.

(c) Creation of groups of teachers in the direction of ' *communities of investigation of the teaching practice of mathematics* ' (Communities of practice) whose members collaborate but also with supporters or other experts of the flipped classroom and the Didactics of the cognitive object for the planning and the didactic framing of the

PS in practice. The initial groups of teachers are formed by the teachers of each school unit, who are the internal members of the potential communities of inquiry, while the supporters of the pilot application from each partner (at least 1 per subject) constitute their external members. The main aim is for these initial groups to progressively establish self-sufficient local 'communities of inquiry' made up of the teachers of one or more school units. In the direction of the effective functioning of the above groups, it is important to provide the possibility for co-planning and reflection and, where possible, the teachers to experiment with the themes of the scenario. In addition, it would be ideal for videotaping some lessons to systematically capture and discuss possible shifts in teaching practice and professional development.

Team meetings need to be carefully planned and held as regularly as necessary. The consultative supporter can visit (in person or electronically) teachers' classrooms and record events for discussion with teachers in a diary. Such a practice would contribute to the identification of important elements as well as cases of teachers or school units of particular interest, which would provide valuable data for evaluating the pilot application.

Regularly work with teachers to support (a) – (c) supporters. Each partner determines meetings between supporters and educators according to local conditions. Interaction and communication between supporters, as much as possible, is judged to be of particular importance.

2.3 Educational material and suggestions for its utilization

In the context of the development of the CONNECT approach, indicative projects/activities, resources, teaching materials, methodologies, sample training scenarios and activities using digital tools have been proposed that can be used as materials. Therefore, the "Teacher's Guide" will include examples of projects, ways of managing them and websites with interesting projects compatible with the principles of the CONNECT approach. In addition, the classification of projects by country, school, class and subject constitutes a useful guide for selecting, designing and managing projects according to the 'philosophy' of the CONNECT project.

In addition, teachers could use existing school textbooks, the school textbooks of the Greek, Cypriot and Italian courses, as well as related online material. Also, useful educational material is the collection of teaching scenarios prepared by the pedagogical groups of the partners and the training (LTTA, MOOC), characterized as excellent

scenarios and posted on the website. Finally, there is always the possibility of developing new indicative educational material in other subjects by groups of supporters and/or teachers of the Pilot Application. Therefore, the pilot application material is posted on the project website after evaluation.

2.4 Appraisal methodology of the CONNECT approach.

A substantial and systematic assessment/evaluation of the pilot application must exist. This requires collecting and analyzing data from multiple sources to highlight the critical (weak or strong) features of the CONNECT approach. In this direction, the data that will be collected will come from the following evaluation and assessment actions:

i. Recording of the cooperation meetings of the groups (supportive and educational, educational among themselves at school); if there is an agreement of those involved, a tape recorder can be used.

ii. Observance of an Implementation and Reflection Diary by the teachers for each period of the pilot application.

iii. Recording each teacher's teaching plans through submitting the Educational Scenario with all Planning Sheets and Student Worksheets. If an already prepared script is used, no new data is submitted. It must be submitted and posted if it is modified or a new one is prepared. No pilot is possible without a design script.

iv. Maintenance of an Action Diary by the supporting staff (recording actions and collecting important elements/data on a micro- and macro-level). Creation required.

v. Pre and post-tests by teachers and students of their experiences from the pilot's implementation (after the pilot's completion). Creation required.

vi. Pilot Application data submission report per school by each partner. Supporters, ambassadors and Principals of School units are actively participating. The number of students who benefited is recorded. (Template required).

2.5 Conduction of the actual Pilot procedure

2.5.1 Teachers' Preparation

The teachers' preparation process could be completed in the below sequence of steps:

1. Registering at the MOOC.
2. Enrolling on MOOC courses.
3. Studying the material on the MOOC.
4. Studying the material of the LTTA.
5. Studying the guidelines on developing educational scenarios uploaded to the project's website.
6. Studying the course-oriented scenarios uploaded to the project's website.
7. Developing a draft learning plan (for the implementation of a new or an existing scenario).
8. Discussing the draft learning plan with educators who teach the same didactic object within the school environment or outside the school environment.
9. Finding peer-reviewers.
10. Forming communities of practice.
11. At least 360 students and 24 teachers (in total) will participate in pilots aiming to test the delivery of a part of the courses of Language, Mathematics and Physics using the proposed approach for online education.

2.5.2 Piloting Phases for the three topics (Maths, Physics and Foreign Language)

<u>Phase 1:</u>

- Study the supportive material on MOOC and the project's website.
- Fill out the initial data and pre-test questionnaires (for teachers and students) (Google Form).
- Find peer reviewers (educators who will evaluate your scenario before being implemented or during implementation).
- Find coordinators or supervisors.
- Create communities of practice.

<u>Phase 2:</u>

- Implement the Scenario.

- Fill out the post-test questionnaires (for teachers and students).
- Complete the reflection diary.
- Fill out the "Good practice" Template (1 practice per course).

Phase 3:

- Complete a final report in the context of which the entire experience of Piloting should be presented (ANNEX II).

** Do not forget to take photos, capturing significant moments of Piloting*

2.5.2.1 Keynotes of Piloting

1. The scenario should be based on the Flipped Classroom Approach (before class, in class and after class)
2. If you modify an existing scenario or develop a new one, you will have to describe the changes in detail in the reflection diary or the final report.
3. Coordinators or supervisors will be responsible for monitoring the entire Piloting and caring for the data collection process.
4. The scenario should be tailored to the needs of the curriculum (for Maths, Physics and Foreign Language).
5. The "good" practice template should be filled out after the Piloting, indicating good practices in terms of Mathematics, Physics and Foreign Languages. One good practice per teacher and course is needed.
6. The general objective of Piloting is to foster collaboration among students, between students and teachers and among teachers.

2.6 Feedback and Reports

2.6.1 For Teachers

2.6.1.1 Pre-pilot teachers' evaluation phase

The purpose of the survey is to evaluate the teachers' pre-pilot experience in flipped classrooms in terms of obtaining the students' specific learning outcomes (knowledge, skills and competencies), fostering students' active participation in learning activities and improving the whole educational process. (https://forms.gle/Jjaz7GrhpfwYGpBw9)

2.6.1.2 Initial Data Collection

Initial Data Collection will be completed before the pilot implementation procedure to mark some initial information from the teachers, especially as a token of preliminary or informal data. The completeness of initial data is identified before analyzing any given dataset. (https://forms.gle/qJhzm4DAedGRNhD87)

2.6.1.3 Post-pilot teachers' evaluation phase

The purpose of the survey is to evaluate the degree to which the desired objectives have been achieved from the teacher's perspective via students' active participation in learning activities and improving the whole educational process. (https://forms.gle/GGLeaKGSdV3phj539)

2.6.1.4 Reflection Diary

The reflection diary is an "account" of the teacher's work in progress, but more essentially an opportunity for reflection on the teaching experience, providing a means of engaging critically and analytically with flipped classroom content (https://forms.gle/i6miHDDeUkuQU6t48)

2.6.2 For Students

2.6.2.1 Pre-pilot students' evaluation phase

The purpose of the survey is to evaluate the students' pre-pilot experience in flipped classrooms in terms of obtaining the students' specific learning outcomes (knowledge, skills and competencies) via learning activities and the whole educational process (https://forms.gle/brch1szdTSky9U8k7)

2.6.2.2 Post-pilot students' evaluation phase

The purpose of the survey is to evaluate the degree to which the desired objectives have been achieved from the students' perspective through their participation in learning activities and improving their educational process (https://forms.gle/XKPCbs9AKe6rjUxB8)

3 Evaluation

1. Reports on how the implementation was carried out, the difficulties encountered, the impact on students and other details that may be in the teacher's reflection diary.
2. Sending completed questionnaires regarding:
   - degree of cooperation between teachers
   - degree of collaboration between teachers and teachers
   - degree of administrative and administrative support
   - degree of active participation and interactive interaction
   - degree of effective script implementation on innovative practices such as flipped classrooms (reflection diary)
   - degree of use of peer observation and critical friends
   - degree of benefit from the training (MOOCs) (whether the training helped in the Piloting)
   - degree of benefit from LTTA (how much LTTA helped the pilot)
   - the overall degree of achievement of the objectives of the whole project

4 Benefits

1. Familiarization with innovative practices such as the flipped classroom.
2. Gaining experience in developing educational scenarios based on innovative practices.
3. Increasing collaboration between speciality teachers at the school level.
4. Utilization of peer observation and peer evaluation.
5. Utilization of communities of practice in the educational process.
6. Utilization of reflection as a tool for teacher self-improvement.
7. Strengthening-empowering teachers' digital skills.
8. Increasing students' active participation.
9. Improving the learning process.

5 ANNEXES

5.1 ANNEX I. Good Practices

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

COURSE: FOREIGN LANGUAGE (ENGLISH)

Creator	Eftihia Papahristou
Course	English
Didactic unit	Graffiti versus Street Art
Estimated Time	15 minutes
Learning objectives	**Think-pair-share** is a **collaborative learning strategy** where students work together to solve a problem or answer a question about an assigned reading. This strategy requires students to **(1) think individually about a topic or answer to a question; and (2) share ideas with classmates**. Discussing with a partner maximizes participation, focuses attention and engages students in comprehending the reading material. **Why use think-pair-share?** It helps students to think individually about a topic or answer to a question. It teaches students to share ideas with classmates and builds oral communication skills. It helps focus attention and engage students in comprehending the reading material.
Target Group	C Class Students of Junior High School
Description	Think-Pair-Share/Write-Pair-Share The teacher poses a question that demands analysis, evaluation, or synthesis. Students take a few minutes to think through an appropriate response. Students turn to a partner (or small groups) and share their responses. Take this a step further by asking students to find someone who arrived at an answer different from their own and convince their partner to change their mind. Student responses are shared within larger teams or with the entire class during a follow-up discussion. **How to use think-pair-share** Decide upon the text to be read and develop the set of questions or prompts that target key content concepts. Describe the purpose of the strategy and provide guidelines for discussions. Model the procedure to ensure that students understand how to use the strategy. Monitor and support students as they work through the following: **T : (Think)** Teachers begin by asking a specific question about the text. Students "think" about what they know or have learned about the topic. **P : (Pair)** Each student should be paired with another student or a small group.

	S : (Share) Students share their thinking with their partner. Teachers expand the "share" into a whole-class discussion.

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

Creator	Eftihia Papahristou
Course	English
Didactic unit	Graffiti versus Street Art
Estimated Time	15 minutes
Learning objectives	Jigsaw is a collaborative learning strategy that enables each student of a "home" group to specialize in one aspect of a topic. Students meet with members from other groups who are assigned the same aspect, and after mastering the material, return to the "home" group and teach the material to their group members. With this strategy, each student in the "home" group serves as a piece of the topic's puzzle and when they work together as a whole, they create the complete jigsaw puzzle. Why use jigsaw? It helps build reading comprehension. It fosters collaborative learning among students. It helps improve listening, communication, and problem-solving skills.
Target Group	C Class Students of Junior High School
Description	How to use jigsaw Introduce the strategy and the topic to be studied. Assign each student to a "home group" of 3-5 students who reflect a range of reading abilities. Determine a set of reading selections and assign one selection to each student. Create "expert groups" that consist of students across "home groups" who will read the same selection. Give all students a framework for managing their time on the various parts of the jigsaw task. Provide key questions to help the "expert groups" gather information in their particular area. Provide materials and resources necessary for all students to learn about their topics and become "experts."

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

Creator	Eftihia Papahristou
Course	English
Didactic unit	Graffiti versus Street Art
Estimated Time	15 minutes
Learning objectives	(Digital) Escape rooms are a collaborative learning strategy that can be a fun, exciting way to unlock a mystery in a collaborative manner. In physical escape rooms teams work together to solve various clues and unlock codes so that they can essentially escape the room. Escape rooms can be engaging active learning activities that allow students to review course concepts with their peers during class. Escape rooms can translate well into virtual, synchronous settings by building them in a tool such as Google Forms and assigning students to specific groups or breakout rooms to solve the clues. Why use Escape rooms An escape room is a critical thinking adventure game. Participants work together to solve a series of puzzles, riddles and physical challenges to unlock a door. Teachers can craft their own challenges to raise students' motivation to participate in the activity.
Target Group	C Class Students of Junior High School
Description	How to implement Digital Escape Rooms See the 10-step process below presented in Neumann et al. (2020, p. 420-421) to understand how Digital Escape Rooms can be implemented: Determine which group of students you are creating the digital escape room for, the length of time you will give students to complete the escape room, your intended level of difficulty, topic(s) to be covered, and learning objectives. Create a list of the 3-5 most important takeaways from the topic your digital escape room will be covering. Write one question for each important takeaway that would encourage students to demonstrate and/or apply what they have learned. Write a background story that provides the context or theme for the room or environment your students are trying to escape from. Hide clues in the background story that presents the first puzzle students need to solve to unlock the first lock. Find or create an image of the "room" or environment students will be escaping

	from. In step 7, you will hide links to additional puzzles that assist students in unlocking other locks. Create puzzles for the remaining questions you wrote in step 3. Consider using the provided puzzle resources to assist you in creating the puzzles. Hide the links to each puzzle you created in step 6 in the image of the room or environment students will escape from. Create a form for students to submit their puzzle solutions and unlock each of the locks. If possible, create a section for each lock and require response validation for text that contains only the answer; this will prevent students from moving to the next lock before they have submitted the correct response. Compile your background story, room/environment image, and form in a single location for students to access and complete. After implementing, evaluate the learning objectives, get feedback from students about their experiences, and update the digital escape room as necessary.

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

Creator	Eftihia Papahristou
Course	English
Didactic unit	Graffiti versus Street Art
Estimated Time	15 minutes
Learning objectives	Jigsaw is a collaborative learning strategy that enables each student of a "home" group to specialize in one aspect of a topic. Students meet with members from other groups who are assigned the same aspect, and after mastering the material, return to the "home" group and teach the material to their group members. With this strategy, each student in the "home" group serves as a piece of the topic's puzzle and when they work together as a whole, they create the complete jigsaw puzzle. Why use jigsaw? It helps build reading comprehension. It fosters collaborative learning among students. It helps improve listening, communication, and problem-solving skills.

Target Group	C Class Students of Junior High School
Description	How to use jigsaw Introduce the strategy and the topic to be studied. Assign each student to a "home group" of 3-5 students who reflect a range of reading abilities. Determine a set of reading selections and assign one selection to each student. Create "expert groups" that consist of students across "home groups" who will read the same selection. Give all students a framework for managing their time on the various parts of the jigsaw task. Provide key questions to help the "expert groups" gather information in their particular area. Provide materials and resources necessary for all students to learn about their topics and become "experts."

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

Creator	Eftihia Papahristou
Course	English
Didactic unit	Graffiti versus Street Art
Estimated Time	15 minutes
Learning objectives	Why use the Fishbowl Strategy? Fishbowl is a collaborative, engaging and student-centered strategy that builds comprehension of complex texts while developing group discussion skills. In the inner circle—or “fishbowl”—students practice responding to multiple viewpoints. Observations from students in the outer circle provide insight into what makes for effective small-group discussions. Research supports the use of fishbowls as a particularly effective way to engage students with a range of abilities and in multiple settings.
Target Group	C Class Students of Junior High School

Description	How to implement Fishbowl Strategy Choose a text. The text can be read independently before class or in-class. Begin by selecting four or five students to join the fishbowl group. Only students in the fishbowl are allowed to talk. Instruct the outer circle to remain quiet, observe and take notes on the content and process of the inner circle's discussion. The first few times, play the role of the facilitator yourself. Once the process is familiar, select a student facilitator. The facilitator does not participate in the discussion, but poses questions along the way to prompt deeper discussion and to make sure everyone inside the fishbowl has a chance to talk. Identify the focus of the discussion and provide text-dependent questions for students to answer during the fishbowl discussion. Allow the conversation to progress where students take it. Rotate students in and out of the fishbowl throughout the course of the discussion. Set up a procedure ahead of time so students know to expect this rotation. Allow the fishbowl discussion to continue for at least 15-20 minutes. After all students have rotated through the fishbowl, divide the class into small groups and invite students to debrief. Students can use their observations from the outer circle to highlight strengths of the discussion and make suggestions for ways to engage each other more meaningfully. These discussion starters can facilitate the conversations: *What did you observe during the discussion of the text?* *What is one thing you heard that you agree with?* *What is one thing you heard that you disagree with?* *How did you feel while on the outside of the fishbowl?* *How did you feel while on the inside of the fishbowl?* Wrap up the process with a full class discussion. Pose a final question and give everyone an opportunity to respond by turning and talking with a partner or doing a quick write: What is one thing you have learned from the fishbowl process about discussing texts? learningforjustice.org/classroom-resources/teaching-strategies/community-inquiry/fishbowl

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

Creator	Eftihia Papahristou

Course	English
Didactic unit	Graffiti versus Street Art
Estimated Time	15 minutes
Learning objectives	Why use TicTacToe Strategy? Think-tac-toe is a strategy that harnesses the visual pattern of the tic-tac-toe game to broaden student understanding of instructional content, challenge students who already have some mastery of a subject as well as provide a variety of means to assess student mastery in a way that is fun and unusual. A teacher would design a think-tac-toe assignment to support the purpose of the study unit. Each row could have a single theme, use a single medium, explore the same idea across three different media, or even explore a single idea or subject across different disciplines.
Target Group	C Class Students of Junior High School
Description	How to implement TicTacToe Strategy There are 1–4 students per team. Two teams play the game, with one team as Os and the other as Xs. The teacher distributes the premade Tic Tac Toe grids, or the students copy them from the board. The teams take turns choosing any square to try to score “3 in a row.” The team jointly makes one sentence with the selected grammar or vocabulary. The other team judges the sentence with teacher assistance, if necessary. If correct, the team places the appropriate letter (O or X) in the square. If the sentence is incorrect, the square stays as is. The winning team is the first to get “3 in a row” horizontally, vertically, or diagonally.
	You can make several grids on a piece of paper and then copy one per team, or you can have the students draw their own game boards modeled after your sample on the board. You might want to consider placing more difficult language items in the center row going across the puzzle. That way, for a team to win, they will likely need to get a harder item correct. Suggested grammar forms to use:

	simple past irregular verbs (write the infinitive form and a past form needs to be created; e.g., to ask, to believe, to cry, to go, to protect, to sing, to talk, to wish, to give) adverbs or adjectives (use one part of speech and the other needs to be created; e.g. slow, quick, happy, bad, fast, sweet, silent, angry, extreme) verbs followed by gerund or infinitive (write the verb and a second verb in the infinitive or gerund form needs to be created; e.g., start, stop, try, begin, dread, forget, keep, need, regret, remember). You can also use vocabulary from any text the students are studying, interested in, or learning.

COURSE: PHYSICS

Activity in Coulomb's law

Pre-activity prediction
Consider that a force F is exerted between two charges q_1 and q_2. If we increase the distance between the two charges, the measure of the force
a) will increase
b) will decrease
c) will not change

Briefly justify your view
……
……

Activity
Open the following link:
http://www.seilias.gr/index.php?option=com_content&task=view&id=74&Itemid=32&catid=20

A. With charge values q_1 = 1 μC and q_2 = 2 μC, move one or both charges to the distances shown in the table below. For each position measure the electric force and complete the table below
Table 1

	Distance r (cm)	F (N)
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	

B. Based on the findings from your measurements, is your prediction confirmed or not?
Explain …….

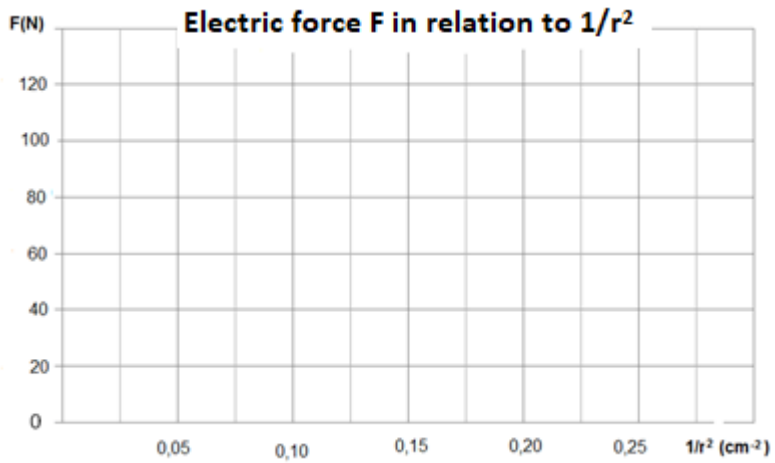
C. Make the appropriate calculations using a calculator and complete the following table.

Table 2

α/α	r (cm)	r^2 (cm^2)	$\frac{1}{r^2}$ (cm^{-2})	F(N)

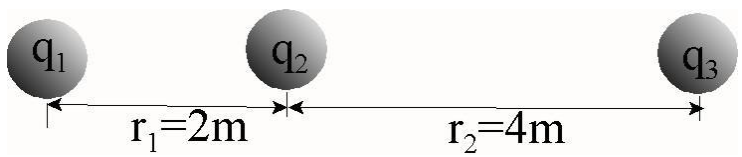
1	1			
2	2			
3	3			
4	4			
5	5			
6	6			

Draw the graph F=f($\frac{1}{r^2}$).



Conclusion……
……

Post activity task



In the figure above, all the spheres have the same amount of charge. The charges q_1 and q_3 are positive, while q_2 is negative.

a) Plot the forces acting on each charge.

b) If q_2 is left free

A. it will move to the left

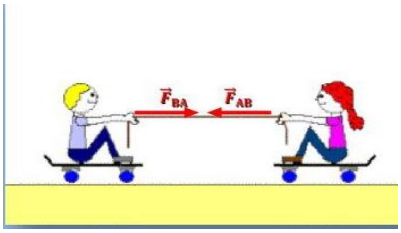
B. it will move to the right

C. will remain stationary

Choose the correct one and explain your choice.

Activity in Newton's 3rd law

Pre-activity prediction



Two children pull on a rope with two springs with a hook attached as measuring devices.

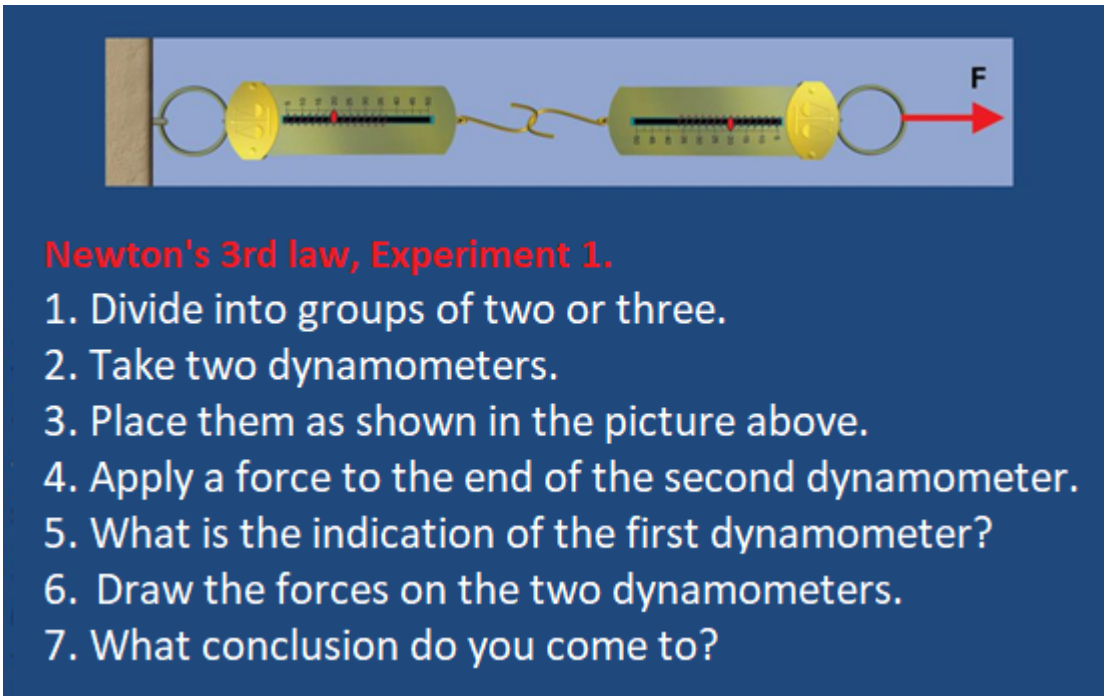
a) the force the boy receives is greater
b) the force the girl receives is greater
c) the forces are equal in measure

Briefly justify your opinion

……
……
……

Activity

Carry out the experiment described in the image below:



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……

Alternative activity, in a virtual environment

Click on the link below:

https://www.seilias.gr/index.php?option=com_content&task=view&id=582&Itemid=32&catid=21

In this virtual experiment there are two wagons in which we can place boxes of different masses. You also have the possibility to vary the strength of the magnets that cause mutual attraction between the wagons. Once you are familiar with the application, set the power of magnet 1 to be twice that of magnet 2 and by varying the masses, complete the table below:

Table 1. The power of magnet 1 is twice that of magnet 2

α/α	Wagon mass 1	Wagon mass 2	F_1	F_2
1	*1*	1		
2	*2*	1		
3	*3*	1		
4	*2*	3		
5	*1*	3		

Then reverse the power of the magnets and complete the table below.

Table 2. The power of magnet 2 is twice that of magnet 1

α/α	Wagon mass 1	Wagon mass 2	F_1	F_2
1	*1*	1		
2	*2*	1		
3	*3*	1		
4	*2*	3		
5	*1*	3		

What do you observe? To which conclusion do you arrive at?

……

……

……

Post activity task

Is the horse right? Explain your opinion

Phase A activity: Exploring sound

Expected learning outcomes	Activities	Materials/Tools	Time

Raising interest in sound and its characteristics. Explain that the sense of sound is caused by vibrations. Identify the characteristics of sound: volume and pitch.	Activities 1A, 1B and 1B΄. Study the characteristics of the sound produced by stretched rubber bands.	Activities 1A, 1B and 1B΄. 1 container (wooden or plastic taper type) 2 common rubber bands 1 small thin wood or two small hard business cards joined together.	30’

Activity 1A: Vibration and sound

Attach one end of the rubber band to a fixed point, e.g. the handle of a drawer and pull the other end of the rubber band so that it stretches enough. Pull and release one side of the rubber band sharply.

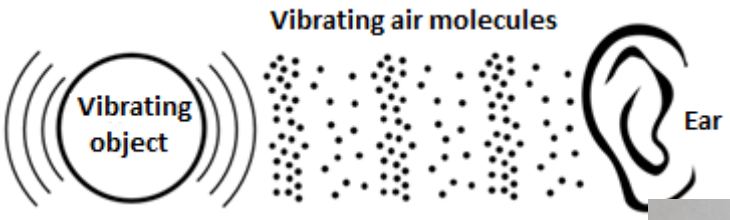
Question 1: The sound produced is loud or faint;

……

Question 2: How do you think the energy emitted by the vibration of the rubber band reaches our ear as sound?

……

……



Activity 1B:

Changing the volume and pitch of the sound

In a container, attach two different rubber bands, as in the picture on the right.

α) Pull a little and leave one rubber band.

Question 3: The sound you hear, compared to the sound of activity 1, is different. Which features of the sound have been differentiated?

……

……

Question 4: Can the presence of air under the rubber bands play a role in the change in

sound characteristics?

……

……

b) Pull enough and leave the same rubber band.

Question 5: Is the sound you hear, compared to the sound of the previous pull, different? In what way?

……

Question 6: Do you think the loudness of the sound is related to the amplitude of the vibration caused?

……

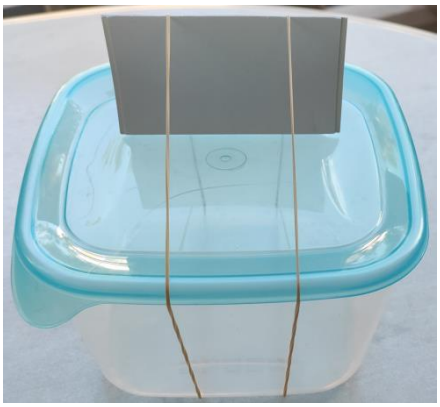
c) Pull a little and release one rubber band.

Question 7: Is the sound you hear now, compared to the sound of the other rubber band, different? In what way?

……

Alternative activity 1B΄

Make the following construction. In a container such as the one in the figure, attach two non-identical rubber bands. About a third of the way down the container, place the two cards upright and slip the rubber bands over them, which should be relatively taut.



α) Pull and release one side of one rubber band very quickly.

b) Pull and release the other side of the same rubber band or the other rubber band.

c) Move the position of the cards forward or backward and pull again the rubber band. Write down your observations.

……

……

……

If there are any questions, write them down so that we can discuss them in class.

Phase A activity: Exploring sound

Expected learning outcomes	**Activities**	Materials/Tools	**Time**
Describe how sound waves are produced and propagated. Relate the intensity and pitch of the sound to the amplitude and frequency of the vibration.	Activity 2A: Watch a video that clearly shows the vibration of the strings of a guitar as they produce sounds. Activity 2B: Study of a simple simulation for sound waves. Announce the findings of each group and discuss in plenary.	P/C or tablet	10' 15' 15'

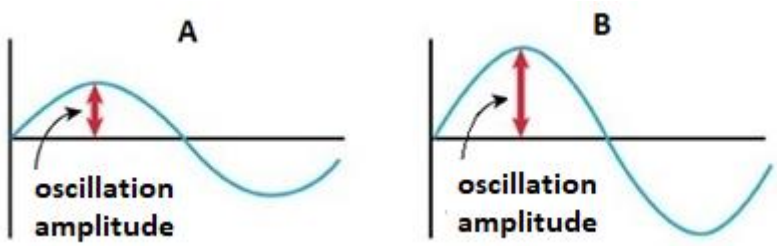
<u>Activity 2A:</u>
Watch the video: The physics of the guitar! In particular, observe the vibration of the strings. https://www.youtube.com/watch?v=RNt8d6vJj8c
To record the vibration you see in the video (so that it can be perceived by the human eye), a camera was used that takes 60 frames per second.)
<u>Question 1:</u> Is what happens to the guitar strings similar to what happened to the rubber bands in the experiments we studied at home?
……
……
<u>Question 2:</u> What characteristic of the vibration/oscillation of the string do you think is related to the intensity of the sound we hear from it?
……
……
<u>Question 3:</u> Why does the pitch of the sound change when we change the chord?
……
……
<u>Task 2B</u>
Study the simulations

The sound wave.
http://photodentro.edu.gr/v/item/ds/8521/11356
β) Visualizing Sound in a Medium.
https://openscied-static.s3.amazonaws.com/HTML+Files/openscied-sound-interactives-master/sound.html?version=v4

Question 4: Fill in the blanks in the sentences with the appropriate words:
α) Sound waves are ..... (transverse, longitudinal).
b) Sound waves propagate ..... (in materials, in vacuum).
c) The number of oscillations an air molecule makes in 1 second is called ..... (period, frequency).
d) The time it takes a wave to complete a cycle is called ..... (wavelength, amplitude)

Question 5: The energy from the vibration of the rubber band (which we did in the activity at home) or the string is transferred to our ear:
α) Because it creates compression and rarefaction patterns that propagate through the vacuum.
b) Because it pushes air molecules towards our ear.
c) Because it causes the air molecules to oscillate and this oscillation is propagated through space.
Choose the correct sentence and explain your choice.
.....
.....
.....

Question 6: The diagrams below show two different sound waves. Which one corresponds to a louder sound?



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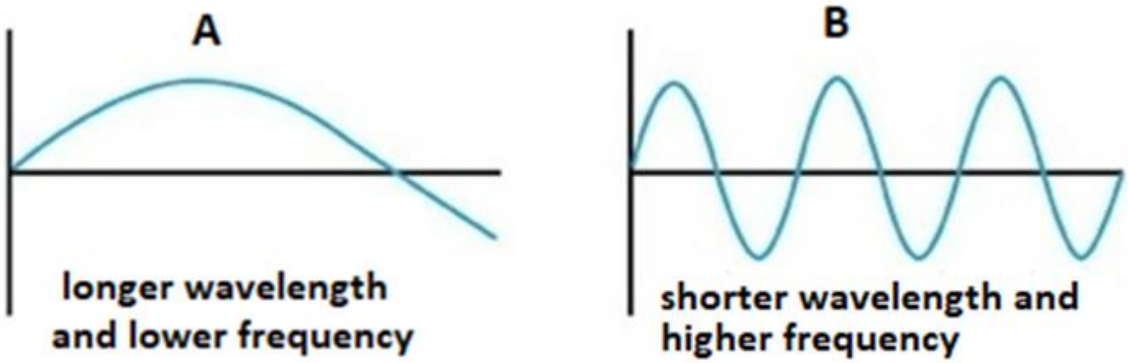
Question 7: The graphs below show two different sound waves. Which one corresponds to a sharper sound (a higher pitch sound)?



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COURSE: MATHEMATICS

Rectangular parallelepiped and cylinder

Creator	RDPSEA
Course	Mathematics
Didactic unit	Volume of rectangular parallelepiped and cylinder
Estimated Time	90 minutes

Learning objectives	It is an experiential activity drawn from students' daily life. Students should be able to: Calculate the volume of the rectangular parallelepiped and of the cylinder. Verify their answers in real cases.
Target Group	14-year-old students
Description	 The planters*: Outside the classroom there are 3 identical empty rectangular parallelepiped planters measured to be 81.2X31X36 centimeters. The students of the class were divided into three groups. Each group of students must cover a planter with natural potting soil. They can use: a) small containers, the radius of which is 8 cm and the height is 25 cm and b) large containers, the radius of which is 10 cm and the height 32 cm. Group A is given cylindrical containers, group B is given large containers and group C is given both small and large containers.* *a) How many pots of potting soil must each team carry to cover the planter?* *b) Transfer containers full of topsoil from the school garden to your planter and verify your calculations.*

PYTHAGOREAN THEOREM

Creator	RDPSEA
Course	Mathematics

Didactic unit	Pythagorean Theorem
Estimated Time	45 minutes
Learning objectives	The activity aims at improving the conceptual understanding of Pythagorean Theorem. The activity is designed to be completed before introducing the algebraic formula and after its proof. The activity places emphasis on inquiry. Students are asked to formulate a conjecture and to test it. It also connects algebraic and geometric ideas and it provides a general pattern.
Target Group	14-year-old students
Description	(a) Copy the table below into your notebook. For each row of the table: Draw a right triangle ABC ($\hat{A}$ = 90) considering the given length of the vertical sides on a dotted sheet (square canvas). Draw a square on each side of the triangle. Find the areas of the squares and fill the data on the table.

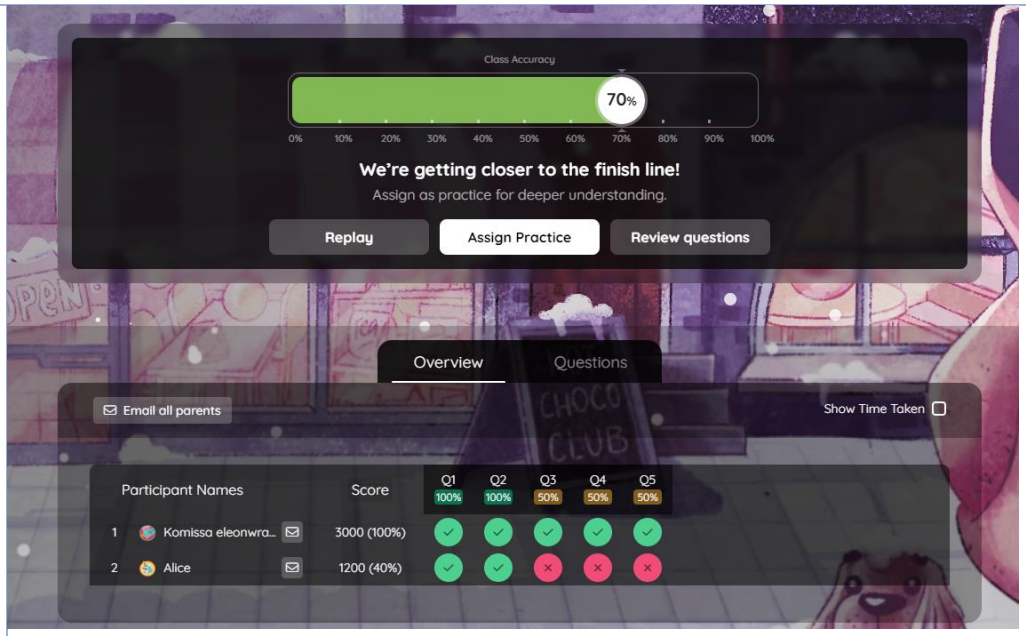
Length of Perpendicular Side AB (units)	Length of Perpendicular Side AC (units)	Area of Square on the Perpendicular Side AB (sq. unit)	Area of Square on the Perpendicular Side AC (sq. unit)	Area of Square on the Perpendicular Side BC (sq. unit)
1	1	1	1	2
1	2			
2	2			
1	3			
2	3			
3	3			
3	4			

(b) Remember that conjecture is the best idea for guessing a mathematical relationship. It's usually a generalization of a pattern that you think may be correct, but you are not aware of its correctness. For each triangle, identify a relationship between the areas of the three

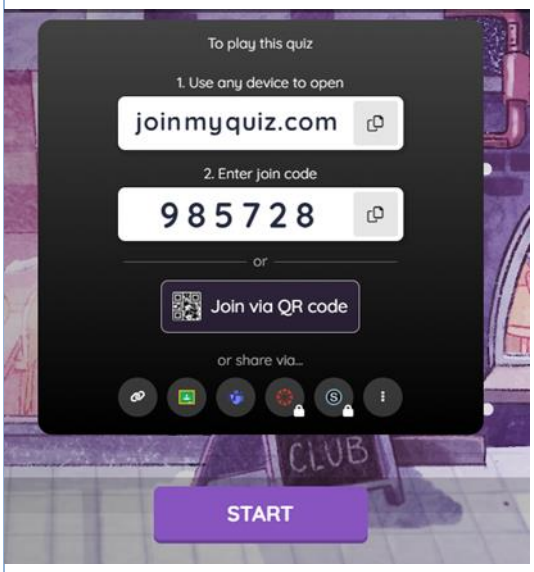
	squares. Come up with a conjecture in regard to the areas of the squares you drew on the sides of each right triangle. (c) Draw a right triangle in a way that the sides' length could be different from those given in the table. Use your triangle to check the conjecture based on question (b).

LEARNING ACTIVITIES KAHOOT

Creator	RDPSEA
Course	Mathematics
Didactic unit	Pythagorean Theorem
Estimated Time	15 minutes
Learning objectives	Revision exercise on the Pythagorean Theorem
Target Group	Students 14 years old
Description	This activity is a revision quiz that was created using the application https://quizizz.com/ and is supposed to be used for the students that have studied the Pythagorean Theorem and the squared roots. This exercise can be used by teachers on students' evaluation, on https://quizizz.com/admin/quiz/63aafa3f042ca4001ed5a201?source=quiz_share. This quiz can be used as a gamification application, either in face to face teaching or in the third phase of distance learning, in education. This game provides each student with his/her results and gives students the opportunity to evaluate their experience playing. The teacher has the ability to check the exercises where each student faced difficulties, can send the results to the parents via e-mail and can estimate the overall time needed for the completion of the exercises by the students.



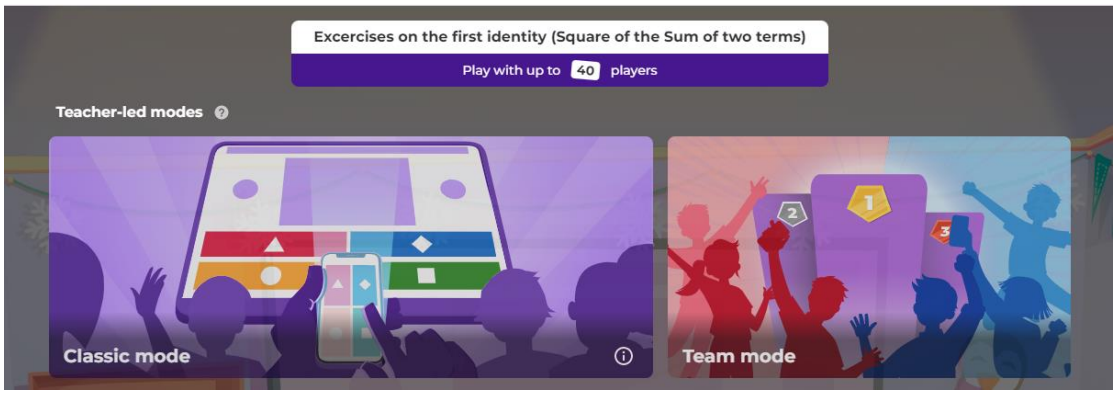
We advise students to enter the site joinmyquiz.com and we provide them with the number that needs to be entered so that they can play the game (985728). The duration of every exercise is set by the teacher. In this example, two minutes are given per exercise.



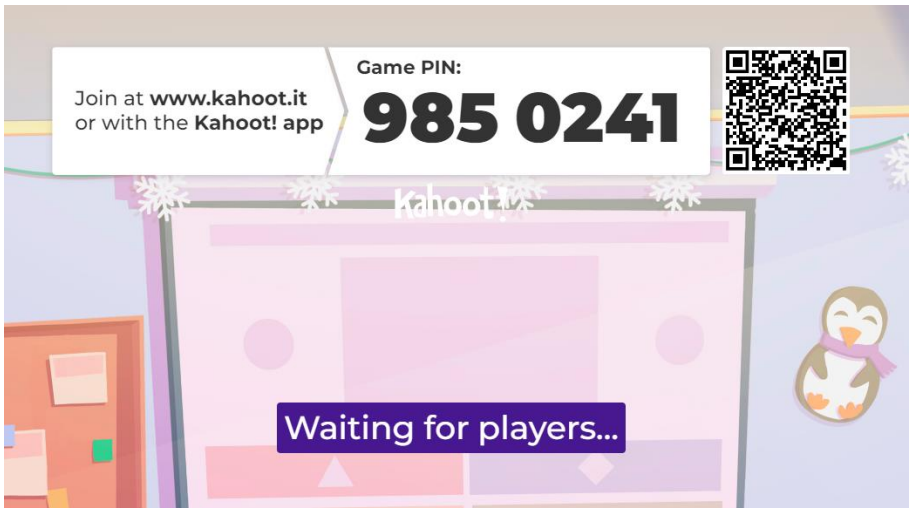
DESIGNING ATTRACTIVE LEARNING ACTIVITIES

Creator	RDPSEA
Course	Mathematics
Didactic unit	Teaching the identity $(a+b)^2=a^2+2ab+b^2$
Estimated Time	Approximately 10 minutes
Learning objectives	Use the identity $(\alpha+b)^2=\alpha^2+2\alpha b+b^2$ in solving exercises. Give feedback on learning, understanding and using the identity $(\alpha+b)^2=\alpha^2+2\alpha b+b^2$
Target Group	15-year-old students
Description	The task can be found at: https://create.kahoot.it/share/excercises-on-the-first-identity-square-of-two-factor-sum/d4951c74-b877-471e-b4f2-98615d368b2d According to sources, 80% of students tend to use playing games as a way of learning. The use of gaming concepts and procedures in the learning process makes up the notion of gamification. Its aim is to attract users to come in contact with non-gaming subjects, through gaming. The teacher can use either the classic mode or the team mode of the game, according to the plan of his/her lesson. The activity can be used in phase C (after the lesson - Distance Learning-asynchronous) as an assessment test for the understanding and application of the identity

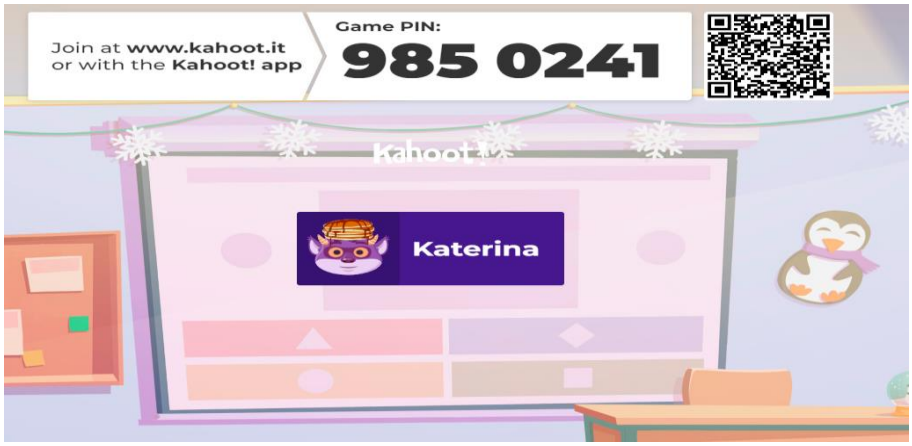
	$(\alpha+b)^2=\alpha^2+2\alpha b+b^2$. The test has been created on kahoot.com. The teacher can either get the reports for every student, by signing up/ logging in, or he/she may continue navigating as a guest, without access to the results.



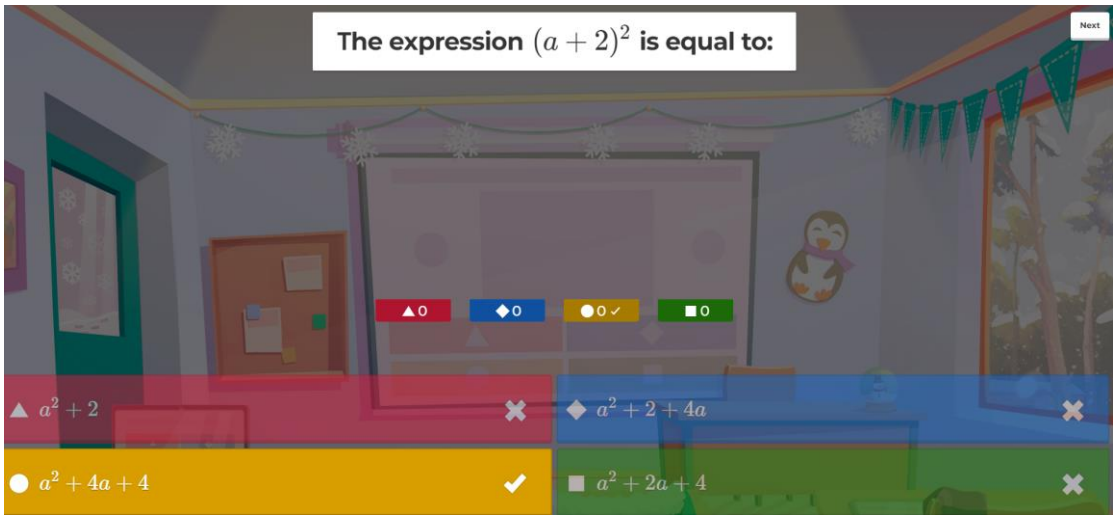
Students can join the game at www.kahoot.it where they may be given the game pin. In every game there is another pin.



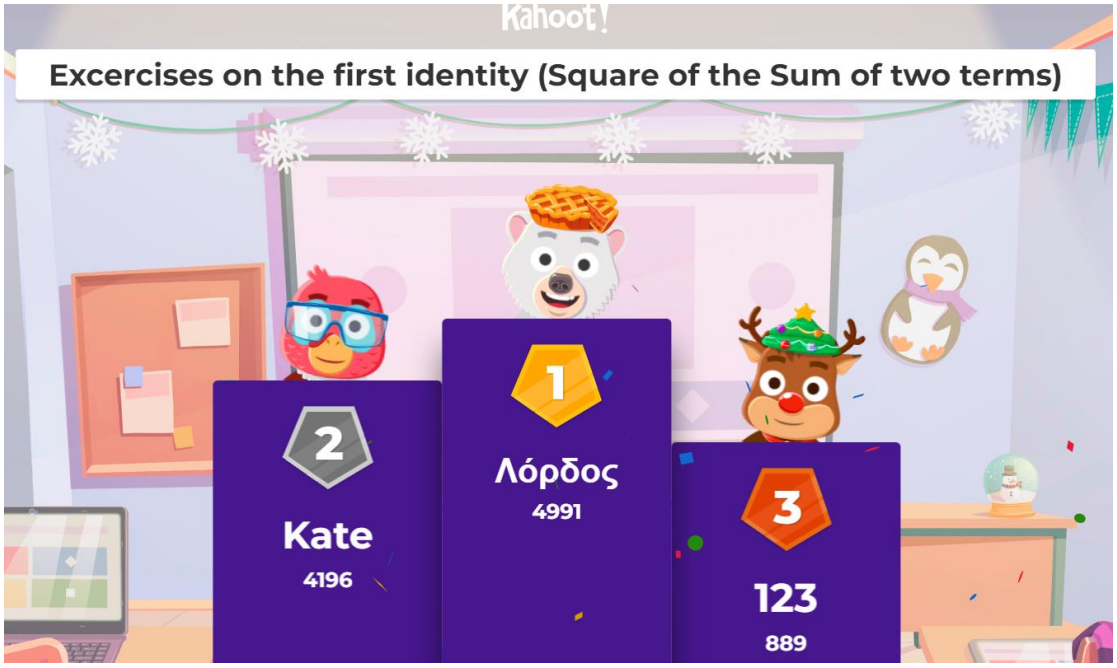
When students join the game, we may have the necessary access to their nicknames.
We invite the students to enter www.kahoo.it and enter the given game pin.



Students must choose the correct answer.

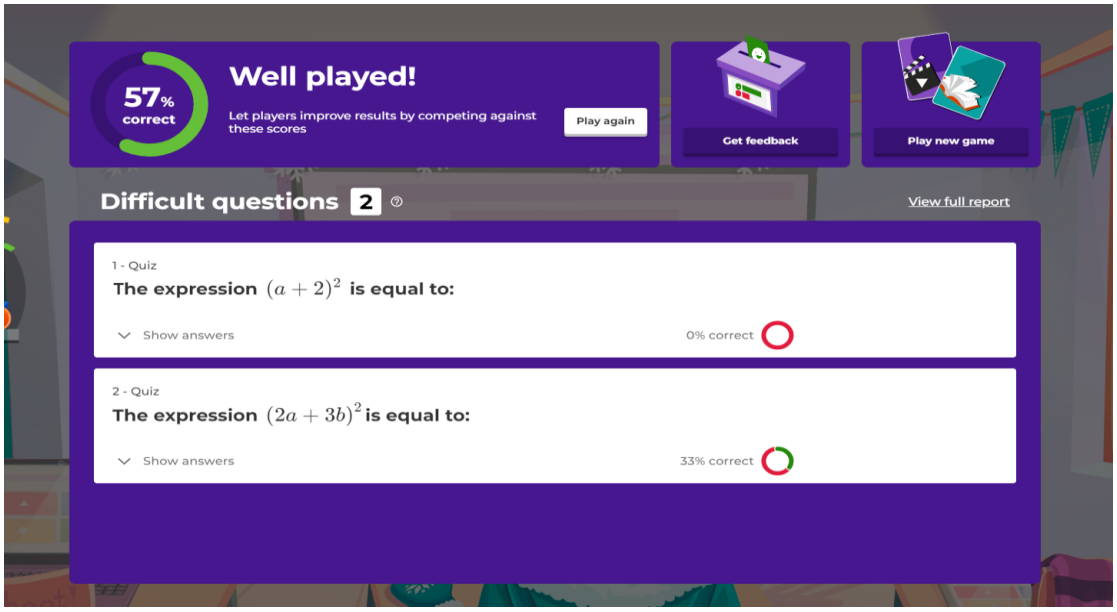


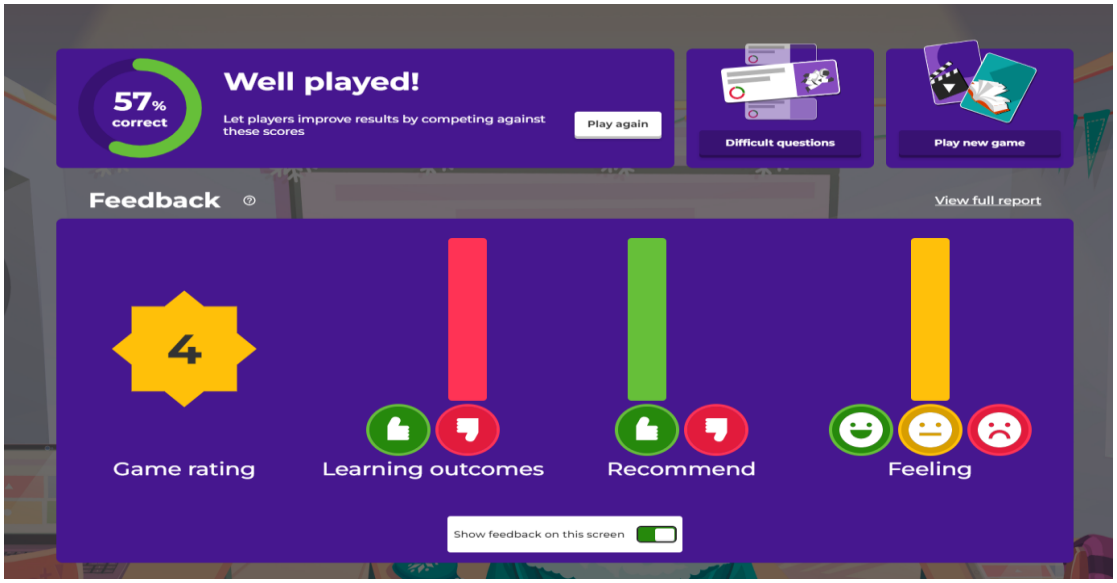
The teacher may have access to the students' answers. He/ She may note the questions which had a great number of false answers, so that he/ she may organize their teaching material and revisions.



After the game's ending, the application kahoot.com, using gaming, presents the 3 players with the highest scores and shows the questions with the most false answers. It also gives students the opportunity to evaluate their experience playing the game, providing the teachers with the necessary feedback on whether this game helped students learn, how they feel about it and whether they recommend it.

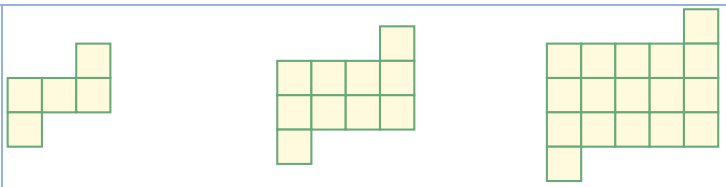
The only noted difficulty is that when students use their smartphones to play the game, they can only see the possible answers as color options and not as phrases- a screen that shows the answers as phrases is necessary in the classroom.


57% correct
Well played!
Let players improve results by competing against these scores
Play again
Get feedback
Play new game
Difficult questions 2
View full report
1 - Quiz
The expression $(a+2)^2$ is equal to:
Show answers
0% correct
2 - Quiz
The expression $(2a+3b)^2$ is equal to:
Show answers
33% correct


57% correct
Well played!
Let players improve results by competing against these scores
Play again
Difficult questions
Play new game
Feedback
View full report
4
Game rating
Learning outcomes
Recommend
Feeling
Show feedback on this screen

Designing an algebraic expression

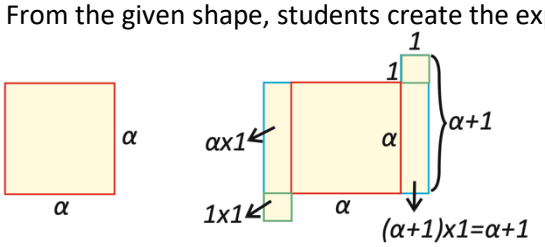
Creator	RDPSEA
Course	Mathematics
Didactic unit	**Designing an algebraic expression**
Estimated Time	Approximately 90 minutes
Learning objectives	Expansion, generalization, remarkable identities, transformation of algebraic expression, area of rectangles. Figurative and evolutionary patterns, finding the rule, recursion, generalization, investigation, reasoning.
Target Group	15-year-old students
Description	Problem A: Design an algebraic expression a) Represent geometrically the expression $\alpha^2 + 2(\alpha + 1)$ where a is a positive number. b) Show that, whatever the value of the positive number a, the following four expressions are equal: $\alpha^2 +2(\alpha+1)$ $(\alpha+2)^2 -2(\alpha+1)$ $\alpha(\alpha+2)+2$ $\alpha^2+2\alpha+2$ Problem B (Pattern): the small squares With small identical squares, we construct a pattern according to the evolutionary model below. Find a way to count the number of small squares of an element of any step.

			
	Step 1	Step 2	Step 3

Teaching guidelines

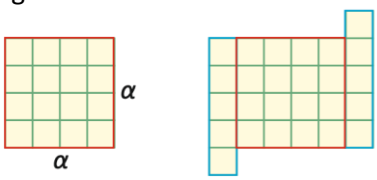
Problem A: Design an algebraic expression (45 minutes)

In the context of differentiation, recourse to manipulative material is suitable for the formation of mental representations. From the given shape, students create the expected shape.



α^2 $\alpha^2 + 2(\alpha+1)$

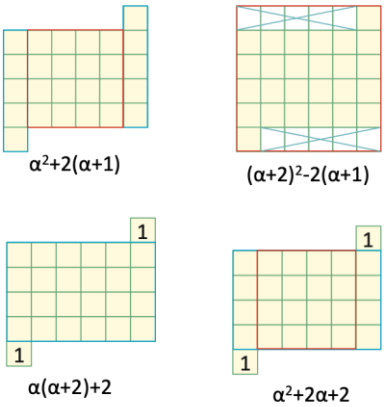
The square can be divided into smaller unit squares. In this case the 4x4 square is an example. However, we are referring to the general case axa.



α^2 $\alpha^2+2(\alpha+1)$

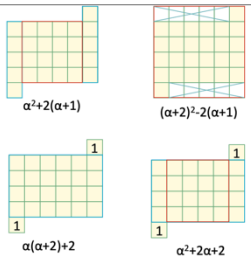
B. Problem B (Pattern): the small squares (45 minutes)

This approach promotes the formation or stabilization of mental representations of the distributive property and the product. The proposed geometric approach has the advantage of reducing shape errors $\alpha(\alpha + 2) = \alpha^2 + 2$.



The meaning of each algebraic expression is formed using rectangle area representations (rectangular numbers, product expression).
Geometric interpretations make it possible to prove the equality between the four algebraic expressions. Some students find it difficult to escape the idea that representations are made for a particular value of a.

Teaching strategies
Figurative and evolutionary patterns, rule finding, recursion, generalization, investigation, reasoning.
In this figurative regularity, recognizing the structure and explaining it is of a higher level of skill because the relationship is not linear.
The problem gives rise to work in algebraic calculus in order to justify the equivalence of the representations proposed by the students.

Strategies	Patterns	Comments
We count the small squares at each step.	The numbers we need to add, to move from one step to the next, are the odd integers greater than 5. Steps: 1, 2, 3, 4, ... Number of squares: 5, 10, 17, 26 +5 +7 +9	With a spreadsheet, for example, we get the number of small squares for a given step.
We identify a structure that includes a large square or rectangular layout.		Proving the equality between different algebraic expressions will make it necessary to use algebraic properties of calculus to transform the expressions (factorization and expansion).

COURSE: FOREIGN LANGUAGE (FRENCH)

DESIGNING ATTRACTIVE LEARNING ACTIVITIES

FRENCH – JEU DE FRANCOPOINTS

Creator	RDPSE of Attica Stelios Markantonakis
Course	French
Didactic unit	I speak about myself (linguistic knowledge)
Estimated Time	30 min
Learning objectives	Vocabulary and syntax
Target Group	LEVEL A1
Description	This activity is based on the game "Who wants to be a millionaire?" It can be used to summarize the ways to introduce yourself to others and the opposite. However, it can also serve a revision purpose in any other case. Finally, it can be used in terms of a project, in the context of which students could develop their own game. The activity is available at the below link: http://photodentro.edu.gr/ugcc/Franconnaire1_pidx006839

5.2 ANNEX II

FINAL REPORT TEMPLATE

Country	
School Name	
School Address	
City Background (School's location)	Citizens' Financial Status, Cultural state, Geographical features (geographical terrain)
Total Number of Students Attending (Divided by Gender)	
Number of Students attending (per course) (Divided by Gender)	
Supervisor's Name and Surname	
Average Students' Age (per course)	
Highlighting the reverberation of piloting at students (per course) - Fostering collaboration - Fostering participation - Developing skills	
Highlighting the reverberation of piloting at teachers (per course) - Fostering collaboration - Enhancing their teaching approach - Upskilling and Professional Development	
Indicating Lessons Learnt from piloting (per course) - Instructional Shift - Need for developing collaborative skills - Changes of roles	
Indicating Good Practices drawn from piloting (per course) - Total number of Good Practices - Keynotes of Indicative Good Practices	
- Assessing the peer-review process and the communities of practice - Contributing to the pilot implementation - Contributing to ameliorating the	

learning process - Contributing to professional development - Contributing to overcoming difficulties - Contributing to understanding the "CONNECT" approach	
Assessing the entire Piloting - Regarding the pilot objectives - Regarding the "CONNECT" approach objectives (upskilling	
Describe a memorable moment that marked the entire Piloting - A memorable comment - A significant moment - An important feeling - A critical didactic incident	
Pilot improvement - Regarding planning - Regarding implementation - Regarding Evaluation	