IO1 - Guidelines to enhance the quality of Collaborative work through EdTech

Solutions for software and methodology

Partners

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Project Summary

In a classroom, it is often difficult to get students involved in the discussion, both with peers and the teachers. This also means that students seldom can raise their voice, discuss, or enhance their analytical and social skills in an academic environment. There have been many initiatives to overcome this challenge. Educational technology and collaborative work are amongst these. And both have proven to be effective. Educational technology has the advantages of involving students, raising engagement and motivation, enhancing peer learning, and ensuring easy diagnosis for the student groups when used correctly. It also provides the lecturer with possibilities of facilitating the usage of EdTech, give immediate feedback to the group, and it should be easy to integrate into existing lectures. Collaborative work has the advantages of enhancing social skills, redirect educational and social strategic goals for the students, and improve the learning environment. iLikeIT2 wants to combine all these advantages and develop an online application with appropriate methodological guidelines to enable lecturers to easily and in a time-efficient way connect students in a randomized group and receive responses from all participating students. The students will discuss the teacher's task with peers and try to agree upon a solution. This answer will, in turn, be submitted and object to plenary discussions facilitated by the teacher. iLikeIt2 will be a variation to the traditional group work, where anonymity and written language will be focused more than physical contact and verbal expressions.

This will be achieved through research-based approaches, redeveloping an existing tool, and providing all outcomes for free to all interested parties. The Consortium, consisting of five partners from Norway, the UK, Italy, Spain, and Greece, with strong networks both in higher education, lower levels of the school system, and the VET sector, has extensive expertise and international experience projects. The scrum management method implemented in the project is to ensure all partners can utilize their internal strengths. The project mainly targets Higher Education Institutions, mainly cause the challenges with collaborative work is more significant when the groups are large and the academic tradition is conservative. Still, the project develops universal methodology and tools that can easily be adapted to other educational and entrepreneurial sectors.

The project will produce real results that can be used and implemented directly during and after the project's end. The main results will be a functioning prototype of a response tool that will include randomizing groups, request feedback, and manipulate results directly in plenary after the voting ends. Technology is nothing without methodology, though, and the Consortium will direct their main effort towards making guidelines and a pedagogical strategy for making the software useful for teachers and students. It is also necessary to sustain the system and make the impact higher, so the Consortium includes Technical specifications and an adoption strategy to disseminate further and maintain the results.

The project activities include research to validate the outcomes, pilots of parts and/or the whole output, and multiplier events to disseminate. Also, the development and testing of the new software will be ongoing for the entire period. iLikeIT2 has excellent potential for impacting all over Europe and in many different sectors of the Educational System. It will be beneficial for all institutions providing education, no matter the size of groups, and will contribute to a change in how we do collaborative work with student groups.

Description of Intellectual Output n.1

The project iLikeIT2 has the goal of fostering collaborative work in class by developing a functioning prototype of a response tool that will enable lecturers to organize students easily and time-efficiently into groups and receive responses from all participating students.

Effective software development requires an exploratory approach. In order to coming up with an innovative tool and better organise the software development work, Consortium deemed necessary to analyse first which Educational Technology (EdTech) recent years have already brought us and thus do a precise assessment of tools already in the market and identify their functionalities and see what it is more/less valued by teachers and students when using them. **This step was necessary to be better identify the problem Consortium is trying to solve, investigate requirements from the tool's target group of users and identifying solutions (functionalities) for enhancing the quality of the collaboration to be built in the software.**

Initial plan was to test and report on bout ten different collaborative work tools, with best practice examples and feedback from students. But during the last year, with the pandemic defining a lot of the many educational practices, the usage of EdTech has increased and the number of tools has expanded and their functionalities have evolved. Thus, Consortium expanded their work as well and nearly 50 tools have been taken into consideration for the assessment.

The assessment consisted in doing desktop research on their abilities, and then perform pilot testing with students and teachers to have a closer look at the impact of the main functionalities tools have. This kind of analysis was complemented with reflectional conversations with main users of Educational Technology, teachers/instructors and students to get their experience and insights on their use of EdTech. Plus, Consortium carried out a selection of best practice examples of collaborative work activities coming from Consortium partners' experience and project pilot testing implementation.

Based on this work, Consortium got data for defining both the software and a suitable methodology to be made in the project.

This Intellectual Output consists of 4-four sub-sections:

1. **Report on ICT strategies in Europe and countries member of the iLikeIT2 Consortium;**

2. **Methodology for Research, including the work of Tools Assessment, Pilot testing and Reflectional Conversations carried out by the Consortium;**

3. **Findings from Research and Recommendations for the iLikeIT2 software;**

4. **Best-cases resulting from the Pilot testing.**

This Intellectual Output is highly transferable due to the relevance of the results reported in its subsections and its focus on accurate understanding of end user needs in relation to software architecture. Next step of the project will see these requirements related to usage, functionality, performance, resilience, reuse, maintainability and aesthetic being the starting point for selection of structural elements of the iLikeIT2 software.

1. ICT STRATEGY TRENDS IN PARTNER COUNTRIES

1.1. Introduction

The main aim of iLikeIT2 is to influence the way higher education uses collaborative work in the classroom and research the potential new technology has concerning collaboration and active involvement for the students attending lectures.

From a theoretical perspective, group work, in general, can draw on a sociocultural view of teaching and learning, which holds communication and dialogue as crucial elements meaning making, in addition to individual construction of knowledge[1][2]. According to Lucena et al.[3], the 3C collaboration model (communication, coordination, and cooperation) is essential to developing and analysing collaborative education systems. iLikeIT2 investigates how EdTech can contribute to the collaborative methodology, even if the students are not placed in groups physically. The project's Consortium agrees on the use of Collaborative Learning[4] as a critical competence nowadays in the education sector.

"To use digital technologies to foster and enhance learner collaboration. To enable learners to use digital technologies as part of collaborative assignments, as a means of enhancing communication, collaboration and collaborative knowledge creation"[5]

Activities

- To implement collaborative learning activities in which digital devices, resources or digital information strategies are used.
- To implement collaborative learning activities in a digital environment, e.g. using blogs, wikis, learning management systems.
- To employ digital technologies for collaborative knowledge exchange among learners.
- To monitor and guide learners in their collaborative knowledge generation in digital environments.
- To require learners to digitally present their collaborative efforts and assist them in doing so.
- To use digital technologies for peer-assessment and as a support for collaborative self-regulation and peer-learning.
- To use digital technologies to experiment with new formats and methods for collaborative learning.

Figure 1 - Collaborative Learning: activities according to the European framework for the digital competence of educators

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[1] Mercer, N. (2004). Sociocultural discourse analysis: analysing classroom talk as a social mode of thinking. Journal of Applied Linguistics, 1(2), 137-168

[2] Wertsch, J.V., & Kazak, S. (2011). Saying More than You Know in Instructional Settings. In T. Koschman (ed.) Theories of Learning and Studies of Instructional Practice (p. 153-166). New York: Springer

[3] Lucena, C. J., Fuks, H., Raposo, A., Gerosa, M. A., & Pimental, M. (2007). Communication, Coordination, and Cooperation in Computer-Supported Learning: the AulaNet Experience. In Advances in computer-supported learning (pp. 274-297). IGI Global

[4] Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu (No. JRC107466). Joint Research Centre (Seville site)

[5] Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu (No. JRC107466). Joint Research Centre (Seville site), p.56

To finalize, we would like to stress that the COVID-19 pandemic underlined that an academic community is still not ready to face collaborative learning as a daily reality. Instead, it is an emergency learning, and niche maturity should be reached urgently to address all the 3C within the education field in (online) teaching and learning.

1.2.   European strategies on ICT

The need of ICT in education is highly acknowledged on several levels all over Europe and the world. Digital skills are appreciated as vital 21st century skills. During the last decade we have seen an increase in the worldwide demand for higher education, which is expected to grow exponentially from app. 100 million students currently to 250+ million by 2025[6]. This raises several questions on how higher education institutions (HEIs) will be able to sustain and improve the quality of the learning experience in the face of continuing growth and diversity in the student population. Enhanced digital skills, improved digital infrastructure and innovative methodology for utilizing digital tools and online learning are part of the solution.

We also know that one key aspect in the change towards 21st century skills is the ability to work in groups, which is also pointed out by UNESCO in their report series Education Research and Foresight from 2015: "The collaborative learning environment challenges learners to express and defend their positions, and generate their own ideas based on reflection"[7]. It is also stated that the emergences of new digital innovations create new ways of interacting collaboratively, both through existing tools and new soft- and hardware being developed continuously throughout the whole educational system.

Educational Technology is essential to everyone in order to cope with the demands of the contemporary societies and their working life. In order to ensure real impact on the educational system, the European Union has taken action in order to ensure implementation and equality for all members. To achieve their goals, the Union have implemented strategies and directions for the sector. The European Framework for Digitally Competent Educational Organizations is one of the key elements in the Europe 2020 strategy, which thus acknowledges and emphasizes the need for a digital boost in the following years:

> *Digital technologies are enablers of a step change in learning and teaching practices; however, they do not guarantee it. To consolidate progress and to ensure scale and sustainability, education institutions need to review their organisational strategies, in order to enhance their capacity for innovation and to exploit the full potential of digital technologies and content [8].*

This is further underlined seeing that digitalization on all areas is one of the ten priorities that the European Commission has emphasized in the period 2015-2019. The importance is stated already in the first paragraph: "The internet and digital technologies are transforming our world. Barriers online can deny people the full benefits that digital developments can offer"[9]. Off course the European Union are concerned of all sectors in the Union, but it is acknowledged that a lot of the

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[6] European Commission (2014): Report to the European Commission on New modes of learning and teaching in higher education. ISBN 978-92-79-39789-9/doi:10.2766/81897

[7] Scott, Cynthia Luna (2015): The futures of learning 3: What kind of pedagogies for the 21st Century?" UNESCO series Education Research and Foresight. Working papers. http://unesdoc.unesco.org/images/0024/002431/243126e.pdf

[8] EU Science Hub (2019) 'European Framework for Digitally Competent Educational Organisations'. Available at: https://ec.europa.eu/jrc/en/digcomporg

[9] European commission (2019) 'Priorities, Digital Single Market'. Available at: https://ec.europa.eu/commission/priorities/digital-single-market_en

change starts with knowledge and skills, which makes Education important in achieving the strategic aims.

Therefore the Commission is developing initiatives towards a European Education Area. Several initiatives that impact the digitalization of the educational system in Europe has already been developed, and more are on their way. Many of these initiatives can be found in "Digital Education Action Plan"[10], which is designed as a framework for how the educational system needs to be developed in the future.

1.2.1. Digital Competence Framework for Educators (DigCompEdu)

In a modern age it is vital that both students and teachers are ready for utilizing the new opportunities in the best way possible. The JRC (Joint Research Center) of the European Commission has developed a framework for the competencies needed in the modern age, called *Digital Competence Framework for Educators* (DigCompEdu)[11][12]. It provides a general reference frame to support the development of educator-specific digital competences in Europe. It helps teachers/trainers to discover the level of their personal Digital Competences and provides recommendations on how to develop further.

The framework consists of 22 competences divided in six categories or areas, focusing on different aspects of educators' professional activities. These involve all aspects of the usage of digital tools, from actually using a tool in class to ethics and didactics for enhancing the learning experience.

Table 1 - The DigCompEdu areas

Area 1: Professional Engagement	Using digital technologies for communication, collaboration and professional development.
Area 2: Digital Resources	Sourcing, creating and sharing digital resources.
Area 3: Teaching and Learning	Managing and orchestrating the use of digital technologies in teaching and learning.
Area 4: Assessment	Using digital technologies and strategies to enhance assessment.
Area 5: Empowering Learners	Using digital technologies to enhance inclusion, personalisation and learners' active engagement.
Area 6: Facilitating Learners' Digital Competence	Enabling learners to use creatively and responsibly digital technologies for information, communication, content creation, wellbeing and problem-solving.

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[10] European Commission (2019) *'Digital Education Action Plan - Action 3 Digitally-Signed Qualifications'*. Available at: https://ec.europa.eu/education/education-in-the-eu/european-education-area/digital-education-action-plan-action-3-digitally-signed-qualifications_en

[11] Redecker, C. *European Framework for the Digital Competence of Educators: DigCompEdu*. Punie, Y. (ed). EUR 28775 EN. Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-73494-6, doi:10.2760/159770, JRC107466

[12] *Digital Competence Framework for Educators* (DigCompEdu): https://ec.europa.eu/jrc/en/digcompedu
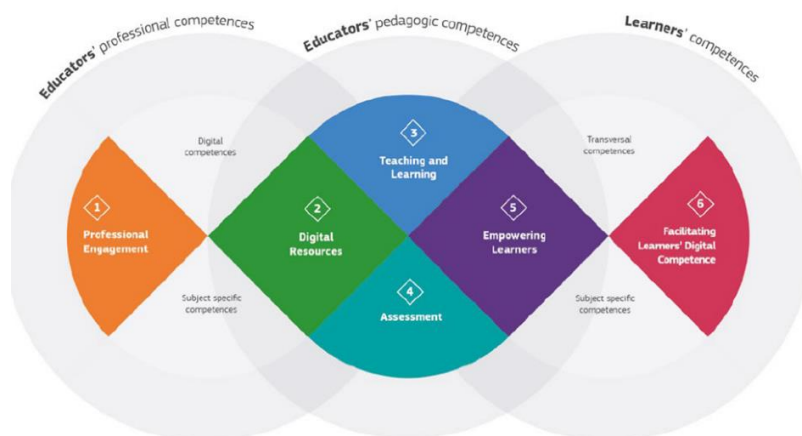
Figure 2 - The DigCompEdu areas
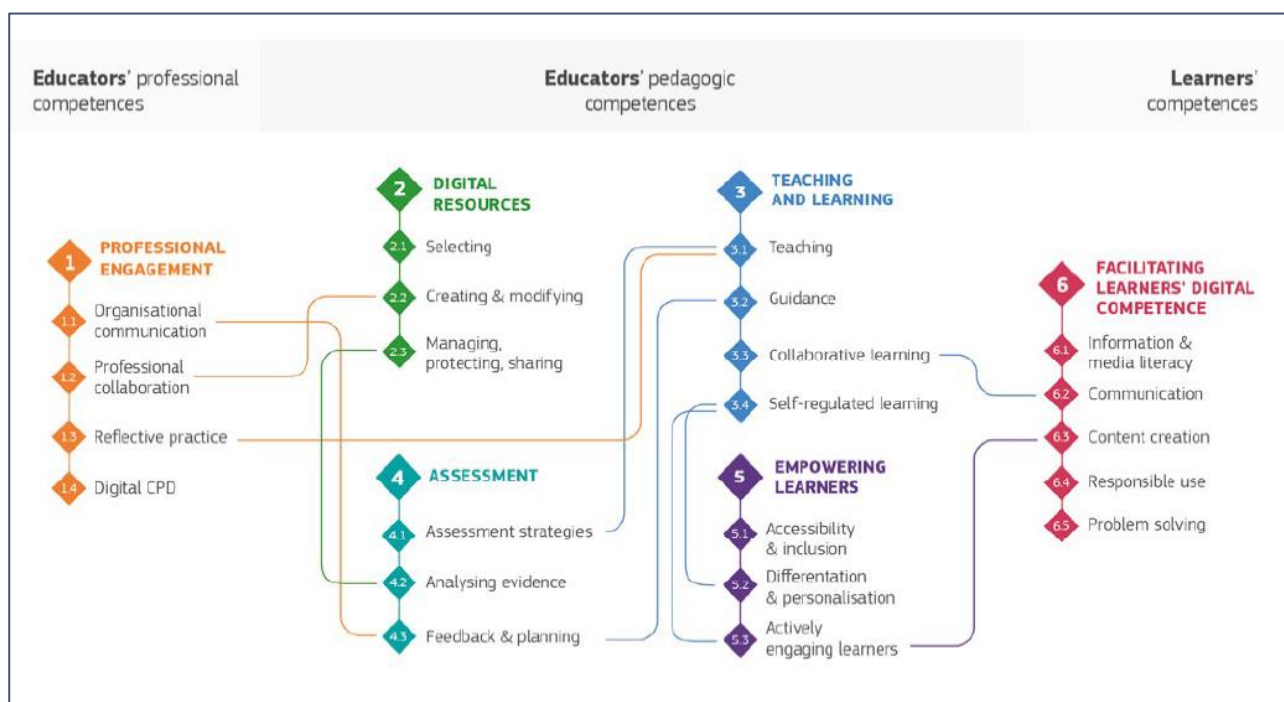
Figure 3 - DigCompEdu competences and their connections

The framework includes an explanation and idea on how to create collaboration in the part on Teaching and Learning: *"3.3 Collaborative learning. To use digital technologies to foster and enhance learner collaboration. To enable learners to use digital technologies as part of collaborative assignments, as a means of enhancing communication, collaboration and collaborative knowledge creation."*

As seen in figure 1, using digital technologies to foster and enhance learner collaboration includes several activities. One needs to implement collaborative learning activities in which digital devices, resources or digital information strategies are used, as well as implementing collaborative learning activities in a digital environment. Learners needs to be exposed for digital technologies for collaborative knowledge exchange and it is important to monitor and guide learners in their collaborative knowledge generation in digital environments. Pedagogically it is important to require

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from learners to digitally present their collaborative efforts and assist them in doing so, use digital technologies for peer-assessment and as a support for collaborative self-regulation and peer-learning and off course use digital technologies to experiment with new formats and methods for collaborative learning.

The idea of thinking inside a framework is useful when considering strategies for digitalisation of the educational system. Still it is vital that the framework and the basic ideas are implemented also at national and regional levels throughout Europe.

1.3. National and institutional strategies on ICT for Education

The iLikeIT2 Consortium could not start their efforts without being aware of the information and communication technologies (ICT) strategies and plans for its implementation for education purposes in place in partner countries. As the EU strategy set the general framework where EdTech have a role in digital transformation, the following paragraphs describe the national contexts which set the level of receptiveness of project results in their Education system.

1.3.1. Spanish strategies on ICT

Technological advances are leading to big changes in the field of education. One of the most significant changes has been the creation of new resources that have allowed digital learning, contributing to more equitative and better-quality education for everyone. Given that the government recognises the importance of these technological advances and the need of society to rapidly adapt to them, the Center for Innovation and Development of Distance Education was created in the year 1992 through the **Royal Decree 1180/1992**[13]. The latter Center currently aims to guarantee distance education to everyone who can't access it by means of an ordinary regime[14].

According to article 2 of the Royal Decree 789/2015, of 4th September[15] that serves to regulate the structure and functioning of the Center for Innovation and Development of Distance Education, it is in charge of offering[16]:

   a) *Distance education of the courses of study offered by the Spanish Education System listed in Article 3.2 of Organic Law 2/2006, of 3 May, with the exception of university education, sporting education and early childhood education.*

   b) *Distance language teaching, promoting multilingualism.*

   c) *The detection and analysis of the educational and training needs of different groups and the development of a range of distance learning courses in accordance with these needs.*

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[13] BOE.es - BOE-A-1992-23316 Real Decreto 1180/1992, de 2 de octubre, por el que se crea el Centro para la Innovación y Desarrollo de la Educación a Distancia (https://www.boe.es/buscar/doc.php?id=BOE-A-1992-23316) .

[14] CIDEAD, Centro para la Innovación y Desarrollo de la Educación a Distancia | Ministerio de Educación y Formación Profesional (https://www.educacionyfp.gob.es/mc/cidead/el-cidead.html)

[15] BOE.es - BOE-A-2015-10198, Real Decreto 789/2015, de 4 de septiembre, por el que se regula la estructura y funcionamiento del Centro para la Innovación y el Desarrollo de la Educación a Distancia (https://www.boe.es/buscar/act.php?id=BOE-A-2015-10198)

[16] Article 2, BOE.es - BOE-A-2015-10198, Real Decreto 789/2015, de 4 de septiembre, por el que se regula la estructura y funcionamiento del Centro para la Innovación y el Desarrollo de la Educación a Distancia (https://www.boe.es/buscar/act.php?id=BOE-A-2015-10198)

d) The development of the necessary technical proposals for the adaptation of curricula and the elaboration of the academic planning measures that make possible the provision of distance learning.

e) The design, preparation and management of the publication, production and distribution of teaching resources that make distance learning possible.

f) The exploration of new ways of exploiting the potential of Information and Communication Technologies to extend the offer of distance learning to new formats and to improve the quality, accessibility and equity of education and training.

g) Innovation in online education models and methodologies and the development of appropriate technologies for their implementation in virtual environments.

h) The initial and continuous training of distance education teachers in the fundamentals and techniques of this modality.

i) Collaboration with the distance education centres and institutions of the Autonomous Communities.

j) Any other functions in the field of distance education assigned to it by the Ministry of Education, Culture and Sport.

The implementation of a distance learning programme from the government itself demonstrates how Spain has used new technologies in an efficient and productive manner, offering a wider adaptability to people who need a different study rhythm or who can't attend physical lessons.

Furthermore, in 2021, the Government launched a programme called "**Educa in Digital**"[17] to boost to boost up technological transformation of education in Spain.

The "*Educa en Digital*" initiative consists of a set of actions to support the digital transformation of the education system through the provision of devices, digital educational resources, adaptation of teachers' digital skills and actions involving the application of artificial intelligence to personalised education. In short, a programme that enables further progress to be made, following the steps already taken in this area, such as the Connected Schools programme, which contributes to providing schools with reliable and quality connectivity[18].

The latter initiative was approved in the year 2020 and aims to be completely implemented by 2024, the budget that has been initially fixed for its attainment mounts up to 236.585.700 €[19], quantity which has been co-founded by European funds (ERDF)[20].

Educa en Digital is a first step of others that will follow to guarantee the correct protection of citizens in the digital sphere, helping to create a trustworthy environment that offers the same rights and responsibilities that operate in the physical sphere. The digitalisation of education is necessary regardless of whether health emergencies similar to the one experienced in recent months can occur.

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[17] El Gobierno lanza el programa Educa en Digital para impulsar la transformación tecnológica de la Educación en España https://www.educacionyfp.gob.es/en/prensa/actualidad/2020/06/20200616-educaendigital.html

[18] Educa en Digital, Red.es (https://www.red.es/es/iniciativas/educa-en-digital)

[19] Educa en Digital, Red.es https://www.red.es/es/iniciativas/educa-en-digital

[20] ERDF: The European Regional Development Fund (ERDF) is an instrument of the European Commission whose purpose is to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions, co-financing public expenditure policies developed by the member states and aimed at achieving this objective - https://ec.europa.eu/regional_policy/en/funding/erdf/

Digitalisation is a determining factor when it comes to closing gaps and supporting social cohesion, making possible a scenario in which students have guaranteed access to appropriate educational content tailored to their needs regardless of their social reality or the place where they live.

1.3.2.   Norwegian strategies on ICT

In Norway the development of ICT-strategies is defined from the government, with a high degree of institutional autonomy. To ensure proper implementation, the government issues new strategic developments every five years, and the last one was executed in 2017, strategy for digitalization of Higher Education in Norway[21]. The Government relies heavily on a department for digital implementation and expertise, Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education (DIKU), to ensure quality in all parts of the digitalization of the Norwegian Educational System. DIKU delivers reports on the digital conditions every three years, with gives valuable insight into the Norwegian situation.[22]

In the strategy one can see that there are high aims for the digitalization of Norwegian Higher Educational Institutions[23]. The students are supposed to meet academic fellowship of staff and students where digital opportunities are being exploited in activating and varied learning- and assessment methods. The student should also have access to a modern, personalized learning environment that facilitates for individual learning experiences, efficiency, collaboration and flexibility in the studies.

Where the students are supposed to be offered great opportunities, considering the teaching staff, there are quite specific demands one should meet in order to hold a position at HEI. The teacher should have good digital and pedagogical competence, i.e. knowledge on how to use digital tools to increase learning in there subject, and they are expected to attend courses and keep updated on the latest digital inventions. On the other side the teachers are supposed to receive incentives for curricular/pedagogical development of their own teaching, and shall be offered a broad set of applications and digital tools and services that aids the implementation of the education, including both pedagogical opportunities and solid infrastructure.

The strategy also defines aims and measures for the institutions connected to digitalization. Firstly it demands a sound pedagogical base competence and experience in teaching when hiring in all professional positions, and successively higher demands concerning teaching competence for employment in positions at higher levels. There has been a discussion between teaching and research in Norwegian higher Education the last decade, and the Digitalisation strategy proposes a merit-system for excellent teaching, which includes and often demands solid digital basic competence.

There are even more measures in the strategy, especially directed towards the strengthening of infrastructure, both teachers and administrations competence and incentives for developing these digital improvements.

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[21] Kunnskapsdepartementet (2017): Digitaliseringsstrategi for universitets- og høyskolesektoren 2017-2021. https://www.regjeringen.no/contentassets/779c0783ffee461b88451b9ab71d5f51/no/pdfs/digitaliseringsstrategi-for-universitets--og-hoysk.pdf

[22] Norgesuniversitetet (2015) 'Digital tilstand 2014' Norgesuniversitetets skriftserie. Available at: https://diku.no/rapporter/digital-tilstand-2014

[23] Kunnskapsdepartementet (2017): Digitaliseringsstrategi for universitets- og høyskolesektoren 2017-2021. https://www.regjeringen.no/contentassets/779c0783ffee461b88451b9ab71d5f51/no/pdfs/digitaliseringsstrategi-for-universitets--og-hoysk.pdf

The strategy does allow for strong institutional autonomy when it comes to implementation of the measures. This is both positive and negative. It allows the institution to develop and integrate the system, solutions and tools they find fit, and allows the teacher at a micro-level to exploit the digitalization in a way that suits the class/group/single student in the way best for this institution. It also creates some difficulties, due to a lack of standardization and equal access to the competence. It is also a problem that delegating the responsibility down at institutional level might lead to different implementation strategies, for example considering funding allocated. It is necessary to anchor the strategy also in local strategies, as we can see in an example from Norwegian University of Technology and Science.

a. ICT strategy in NTNU

This governmental strategy needs to affect the institutions strategies to be effective. Looking at the strategy for the largest University in Norway, NTNU, lasting until 2025, it is interesting to note that there are no explicit references to the National strategy. There are few places where the process of digitalisation is mentioned at all in the strategy, but we can find it some places. Concerning Education and learning environments it is stated: "Students are involved in developing content and learning processes in a tailored learning environment. New technology enables stimulating and varied approaches to learning and assessment, and facilitates access to lifelong education." [24, p. 19]. New technologies are also explicitly mentioned concerning campus development: "Develop sustainable technological solutions" [8, p.34]. Other than these two quotations, it is more focused on other development then ICT competence, and there are no places where the strategy discusses/mentions skill sets or training connected to ICT-competence.

Still the strategy points at the importance of ICT-skills in order to reach the new demands in the 21st century. NTNU actually points at digitalization as the most important point concerning the development of the whole institution:

> *NTNU'S CAPACITY FOR DEVELOPMENT NTNU sets priorities for resources to ensure high quality in our core activities, and develops a leading position in our disciplines so that we can meet society's changes, needs and expectations. NTNU has user-friendly and effective support systems. Future-oriented digital services focused on user needs are available to students and staff. NTNU has robust systems to meet the need for information security, emergency response capacity and protection of privacy. DEVELOPMENT GOALS NTNU will: Have resource management that contributes to increased productivity and creates room for maneuver in terms of strategic priorities and renewal at all levels. Launch digitalization initiatives and improvements that support integrated, standardized procedures and work processes.*

This is problematic when the government leaves it to the micro-level to define the implementation and the methodology for reaching the aims of the national strategy. It also shows the importance of single initiatives and/or cooperation between institutions both regional and internationally when working with Educational Technology.

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[24]   NTNU   (2018):   Strategy   2018-2025.   Knowledge   for   a   better   world. https://www.ntnu.edu/documents/139226/1278574844/20180228_NTNU_strategi_web_ENG.pdf/55963e61-038d-4f55-a7c8-c8e93c2c420b

1.3.3. Greek strategies on ICT

The Greek Ministry of Digital Governance recently presented a Digital Transformation "bible"[25] for the years 2020-2025 outlining a holistic digital strategy that was initially designed before the pandemic outbreak, it had though to move faster due to the urgent situation. The "bible" outlines the guiding principles, the strategic axes and the horizontal and vertical interventions that will lead to the digital transformation of the Greek society and economy. Through collaborations with stakeholders from the public and private sector as well as with the research & academic community and the civil society, the "bible" describes the objectives but also the implementation measures of the digital transformation strategy. It should be noted that the formulation of the Action Plan of the strategy is an open and dynamic process as new actions will be added when needed.

The new national Digital Transformation strategy sets seven objectives as follows:

1. Safe, fast, and reliable access to the Internet for all
2. A digital state offering better digital services to the citizens for all life events
3. Development of digital skills for all citizens
4. Facilitate the transformation to digital enterprise
5. Support and strengthening of digital innovation
6. Making productive use of public administration data
7. Incorporating digital technologies to all economic sectors

The Greek education system is among the most centralised in the OECD[26]. The government sets out the general strategic goals of the system and the Ministry of Education and Religious Affairs (MofERA) shapes education policy, monitors its implementation and administers the education system. MofERA has responsibility for the entire education system from pre-primary to adult education, although higher education institutions have greater autonomy[27].

The Hellenic Quality Assurance and Accreditation Agency (HQA)[28] is an independent administrative authority which began its operations in 2006. Its mission is to ensure high quality in higher education. The Mission of the Agency is to ensure high quality in higher education. This is achieved through the periodic (every 4 years) accreditation of the quality of institutions of higher education both in respect of their internal quality assurance system and their study programmes taught in all three higher education cycles (including both short-cycle programmes, lifelong learning and distance learning) and offered by their academic units (Law 4009/2011).[29]

In an effort to expand the usage of LMSs in higher education in Greece in a uniform way, the Greek University Network (GUNet) distributed the platform E-class[30]. Furthermore, it provides support for the implementation of the E-class platform in any institution by facilitating its installation and operation. In addition, the E-class platform provides an internal structure for each lesson, which

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[25] *Digital Transformation bible 2020-2025* (2021, June). Gov.Gr. Retrieved March 15, 2022, from https://digitalstrategy.gov.gr/principles_of_implementation

[26] OECD (2020), *Education Policy Outlook: Greece*, 4 revised ed.) (2020) available at: www.oecd.org/education/policy-outlook/country-profile-Greece-2020.pdf

[27] Administration - Organisation chart. (n.d.). Ministry of Education and Religious Affairs. Retrieved March 15, 2022, from https://www.minedu.gov.gr/

[28] Vision-Mission-Values. (n.d.). Hellenic Authority for Higher Education. Retrieved March 15, 2022, from https://www.ethaae.gr/en/

[29] Vision-Mission-Values. (n.d.). Hellenic Authority for Higher Education. Retrieved March 15, 2022, from https://www.ethaae.gr/en/

[30] Open e-class, e-learning platform. (2017). Open E-Class, e-Learning Platform. Retrieved March 15, 2022, from https://www.openeclass.org/en/about/

promotes communication between learners and educators, learning with active participation and ensures open and free access to educational material as a result, the Open e-class was adopted by most of the Universities and TEIs. Pange & Lekka (2012) in a pilot study of examining the educational packages offered via Internet by Universities and TEIs in Greece, they found out that 72% of the randomly selected courses were delivered by Open eClass. Although the official LMS of most Universities and TEIs is e-class, the flexibility of Moodle as well as the fact that it does not cost anything has made it attractive to many universities who use it as a secondary LMS[31].

The eLearning and Multimedia Production Support Center (KYMA)[32] is a production unit of the Academic Internet-GUnet, a non-profit company of all the universities of the country. Its activities concern the academic community of the country, i.e., the teaching, research and technical staff of the Universities. provides an integrated set of services to support e-learning and the production of multimedia educational material. The services cover a wide range of needs that have arisen from the development of new technologies and are intended to support both the educational and research activities of academic institutions. The services of the KYMA can be used to complement the traditional educational process by exploiting the benefits and potential of e-learning technologies.

1.3.4. Italian strategy on ICT

To attempt to move the country into the twenty-first century, in 2019 the Italian Minister for Technology Innovation and Digitalization approved *Italia 2025* [33], a five-year strategic plan for implementing digital and innovative solutions into Italian society. The plan prioritizes a significant effort to build new digital infrastructure for broadband and 5G technology and set Digital Education as a basic principle: "*computer culture and digital skills are essential requirements for full citizenship. The public and private sectors must invest to foster skills development as they are determining factors for growth, competitiveness, creation of public value, and the well-being of the country. Also, schools, universities, and the media should contribute to fighting all forms of digital illiteracy.*"

The Strategy's priorities and lines of action for Education focus on:

- For Education:
    - Digitalization of the school system
    - Development of students' digital skills and culture
    - Digital training of teachers
    - Strengthening ICT training as part of transversal skills and pathways
    - Strengthening orientation programs for high school graduates

- University and Higher Education
    - Cooperation between School and University
    - Adaptation of teaching delivery methods
    - Definition of a digital portfolio
    - The connection between universities and the private sector
    - Strengthening human capital and infrastructure

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[31] Kabassi, K., Dragonas, I., & Ntouzevic-Pilika, A. (2015). *Learning management systems in higher education in Greece: Literature review*. 2015 6th International Conference on Information, Intelligence, Systems and Applications (IISA). https://doi.org/10.1109/iisa.2015.7387981

[32] e-Learning & Multimedia Support Centre. (n.d.). GU e-Learning & Multimedia Support Centre. Retrieved March 15, 2022, from https://mc.gunet.gr/el/home-page-2-2/

[33] Strategia per l'innovazione tecnologica e la digitalizzazione del Paese 2025, https://docs.italia.it/italia/mid/piano-nazionale-innovazione-2025-docs/it/stabile/index.html

ㅇ   Interventions on the current training offer

Therefore, the Strategy is combined with the *Italian National Plan for Digital Education* [34], a policy launched by the Ministry of Education, University and Research for setting up a comprehensive innovation strategy across Italy's school system and bringing it into the digital age. It is one of the pillars of "*La Buona Scuola*" school reform (Law 107/2015), a vision for concrete action reflecting the government's response to the most significant challenges for innovation in the public administration system. The *National Plan* is an organic plan for innovation in Italian schools, with 35 actions organized into five main areas: tools, skills, content, staff training and supporting measures. Innovation in the school system and digital education opportunities are key drivers of this vision.

As for learning practices, the National Plan for Digital Education supports "*initiatives aimed at learning new teaching methodologies which, going beyond the traditional classroom lesson, are also useful to translate the potential of technology into innovative educational paradigms*" and foster the use of digital tools and platforms for teaching and learning, both in attendance and at a distance.

Nevertheless, Italy still stays behind most OECD countries when it comes to equipment and usage of information and communication technology (ICT) in education.

One of the main objectives of past Italian plans was to speed up the uptake of ICT equipment and educational technology in Italian schools and classrooms, making them part of the daily tools of classroom activities. Yet this embedment happened with scarce budget, on a voluntary bases, and focused mainly on primary and lower secondary schools, a patchy presence of equipment which still creates discontinuities in teachers' and learners' experience, limits their opportunities for learning and thus reduces Italy's ability to unleash the full pedagogic potential of technology.

More important, the gap is not so much an infrastructural problem as an educational one. Despite the quantitative results in terms of teachers trained, in terms of quality provisions do not meet the scale of actual professional development needs: with the oldest teacher population in Europe [35], it is not unusual for students to take over ICT with ease and manage digital resources with more confidence than their teachers, or for teachers to have *computer* literacy but not *digital* literacy.

The overall index of educational innovation is held below the OECD average because teaching delivery methods and learning practices failed to develop accordingly to the spread of ICT; Italian teachers still remain more tied to traditional methodologies and have lower confidence in all digital competence areas than the European average.

The use of new technologies for teaching purposes is widely accepted by teachers, but still limited when it comes to classroom activities with students. Truth is that the generic pedagogical approach of Italian schools remains anchored to the times, spaces and sequences of traditional teaching, with repetition of content and marginalisation of learning in laboratory and operational contexts. The new tools and teaching delivery methods are seen as additional and optional so it is difficult to make any innovative teaching practice take off and become stable.

The National Plan for Digital Education focuses mainly on School education. As for Higher Education the Plan set the goal to see new innovation in pedagogy through ICT technologies and delivery of new services for students (cooperative work, availability of online materials, support for student assistance, support for classroom delivery of lessons). Yet, integrating of ICT is almost completely lacking in the Italian system. The use of group activities and new technologies is being carried out

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[34] Piano Nazionale Scuola Digitale - https://www.miur.gov.it/scuola-digitale
[35] Teachers in the EU [2017], EUROSTAT - https://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20171004-1

by only 32% and 16% of teachers respectively. ICT are more used for disciplines with a more marked technical connotation, and definitely underused in humanistic courses.

As for collaborative teaching, it has not yet found a space consistent with that devoted to it by pedagogical research, which tends to highlight its benefits in terms of learning and student motivation. With some significant exceptions, the university has remained singularly reluctant to come to terms with alternative or supplementary models to the traditional transmissive teaching system based on face-to-face lessons given by teachers.

a. ICT strategy in CESIE

Being a non-profit and non-governmental organisation, CESIE's activities do not just specifically concern the university level, but they concern specific fields which touch every level of education: Higher Education and Research; Rights and Justice; Adult, Migration; School; Youth.

The organisation has no specific ICT strategy document; its guidelines mainly refer to all its actions on the Web, making sure that contents are accessible and usable by everyone. CESIE perform learning and teaching activities both remotely than online, according to the specific needs of International Cooperation programmes and EU co-funded initiatives and of learners involved.

CESIE has competent and skilled staff dedicated to improving distance-learning processes and develop different learning environments, platform and tools (e-learning programmes, websites, online surveys, community platforms, etc.). The extent of use of LMS goes from intermediate (electronic learning materials + quizzes for students) to advanced (performing team work, collaborative work, seminars, regular monitoring of students' progress). Videoconferencing for learning/teaching purposes – which was used on 25%-50%, and during Covid19 up to 75%-90% - adopts software such as Google Suite for Education that includes Meet, Zoom and Skype. CESIE normally uses: (1) meeting mode for nonformal education, creative labs and other kind of workshops, (2) webinar approach for formal training based on learning key concepts and notions or to provide in-depth insights. Lessons are often recorded and delivered within project learning platforms; for video contents, CESIE normally uses YouTube and push hard on spreading the concept of an Open Educational Resource that have to be freely accessible.

1.3.5. British strategy on ICT

In 2019 the Department of Education (DfE) in the policy paper "*Realising the potential of technology in education*" recommended *A strategy for education provides and the technology industry*[36] to support and enable the education sector in England to help develop and embed technology in a way that cuts workload, fosters efficiencies, removes barriers to education and ultimately drives improvements in educational outcomes. According to this report there are certain key areas of opportunity where digital technologies can make a significant change. These key areas are:

- Administration processes – "reducing the burden of 'non-teaching' tasks".
- Assessment processes – "making assessment more effective and efficient".
- Teaching practices – "supporting access, inclusion, and improved educational outcomes for all".
- Continuing professional development – "supporting teachers, lecturers and education leaders so they can develop more flexibly".

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[36] DfE Report: Realising the potential of technology in education - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791931/DfE-Education_Technology_Strategy.pdf

- Learning throughout life – "supporting decisions about work or further study and helping those who are not in the formal education system gain new skills".

The framework for change through educational technology (Fig. 1) involves three steps, focusing on (i) setting the vision for transformation through educational technology in fields such as administration, assessment, teaching and CPD, (ii) developing an implementation strategy and overcoming barriers such as infrastructure gaps, limited skills, safety needs and procurement inefficiencies and (iii) implementing, integrating, iterating and innovating solutions.

Figure 4 - EdTech framework for change

The Department for Education provides additional support through "insights on the use of assistive technology in educational settings by pupils and students with special educational needs and disabilities (SEND)". These resources are in the form of a stakeholder report series[37] focusing on Policy makers, Administrators, Educators, Researchers, Developers.

It is quite interesting that the Department for Education has also revised its Digital & Technology Strategy in 2020, "inspired by others in the UK public sector publishing clear and simple strategies for digital and technology". In line with its education technology strategy, the DfE also focuses on developing a successful community of practice amongst its staff. This will be implemented by DfE members joining their respective community of practice and be able to: (i) know which career paths are open to them, and feel supported to progress, (ii) have the time to learn and grow their skills, (iii) have ownership of the quality and standards of their profession, and (iv) collaborate and innovate – finding opportunities for common approaches, new platforms, or identifying new skills or practices.

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[37] Assistive technology (AT) stakeholder reports, https://www.gov.uk/government/publications/assistive-technology-at-stakeholder-reports

The role of Quality Assurance Agency (QAA)[38] for safeguarding sound standards of HE qualifications, and for encouraging continuous improvement in the management of the quality of HE is explained. The aspect that are assessed when performing a university QA audit include:

- Curriculum design, content and organisation
- Teaching, learning and assessment
- Student progression and achievement
- Student support and guidance
- Learning resources
- Quality management and enhancement

The role of digital technologies should therefore be evaluated against all these areas and not solely under teaching, learning and assessment.

It is also critical to reflect on how digital technologies may affect learners in other ways as well. For example, DfE also focuses on the use of ICT in Schools. More specifically, "the ICT mark was designed by the former Becta organisation to enable schools to take a whole-school approach to the use of ICT and benchmark their performance against established best practice". ICT safety is very important and is part of the Education Authority responsibilities [39]. Another important concern is the 'Prevent Duty' and ICT policies in Higher Education (HE). Training for prevent teams, IT staff, data protection officers and security managers also spans across teaching staff. The DfE materials aim at helping HE institutions understand (i) Acceptable Use Policies (AUPs) and the need to have them make specific reference to the statutory duty, (ii) how institutions should consider the use of filters as part of their overall strategy to prevent people being drawn into terrorism, and (iii) the need for clear policies and procedures for students and staff working on sensitive or extremism-related research.

It is evident that putting together an ICT strategy covering an entire institution is a big challenge. The Joint Information Systems Committee (JISC) – established in 1993, dealing with networking and information systems issues in support of Higher Education Funding Councils for England, Scotland and Wales – provides the necessary guidance on how to create "a broad, organisationally-focused digital strategy that develops digital capabilities and harnesses the potential of digital devices and services". The guidance[40] provides the means to:

- "Prepare for a future where technology is connecting the physical, digital and biological worlds".
- "Support the creation of a culture of innovation that embraces the challenge of digital change
- "Prepare for greater student diversity and their learning needs".
- "Enable inclusiveness through accessible digital practice".
- "Encourage leaders to provide more flexible and inclusive programmes of study".
- "Capture and make use of data generated via digital learning environments to inform future provision".
- "Streamline the recruitment to graduation administrative and business processes".

Institutions around the UK have taken onboard these resources and following the impact of the COVID19 pandemic on the delivery of their programmes in blended, hybrid, or even fully online modes are rethinking their strategies.

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[38] The UK Quality Assurance Agency - http://www.qaa.ac.uk/
[39] UK Education Authority - https://www.eani.org.uk
[40] JISC (2021), How to shape your digital strategy, https://www.jisc.ac.uk/guides/how-to-shape-your-digital-strategy

     a. ICT strategy in Middlesex University

Middlesex University has identified its strategic priorities for its 2031 strategy [41] as:

- Transforming learning
- Creating impact
- Constructing a learning organisation

The strategy is fully aligned with the UN's 17 Sustainable Development Goals (SDG). With a belief that entrepreneurship can be key for a fair and inclusive future, the institution fosters skills for economic participation and success to build a more equal, caring and prosperous society. Globally, the institution's expertise influences economic, social and environmental policy and practice, enables the creation of change within communities.

1.4. Relationship between ICT-strategies and iLikeIT2

The significant expansion of ICT in education has established a new paradigm of social learning, networking, communication and technology development, which has required all countries to accelerate the implementation of a new vision in education. ICT has become more than a mere teaching and learning tool, and countries have set their strategy considering its potential for improving the quality and standards of educational process and education system. ICT applications in education should help meet the challenges of knowledge societies, contribute to the reduction of the digital divide, including disparities in access to knowledge, and provide opportunities for attaining quality education and lifelong learning for all.

Overall, governments as well as partner organisations seem to recognize the importance of integrating ICT in education. The national strategies just described above, aligned with the European ones, reflects the awareness of the importance of the technological advance and of the challenges innovation has brought to the educational system worldwide. In all partner countries, the urge for action has produced the establishment of dedicated departments/centres/offices to better guide government policies and ensure quality in courses of actions.

"Digitalisation" is the key word in all partner countries' strategies. In all partner countries, national strategies address the transformation of the educational system, focus on providing the necessary infrastructure to educational institutions at all level and creating the basis for the setting up and evolution of a quality environment for both in-person and distance learning.

In that sense, it is evident in all national strategies how governments are aware that a successful application of ICT in education does not depend on the features and functionalities of the technology only: as technology increasingly penetrates the education system, quality in education is more and more connected to digital and pedagogical competences of teachers.

This necessary enhancement of the pedagogical approaches – with a major consideration of the social and cognitive aspects of learning – can no longer be dissociated from an efficient use of EdTech tools to facilitate the teaching/learning process.

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[41] Middlesex towards 2031, https://mdxstrategy2031.co.uk/wp-content/uploads/2021/12/READ-OUR-STRATEGY-ON-A-PAGE.pdf

Project iLikeIT2 starts from this awareness and intends to work on this double front, linking the development of an innovative software for collaborative work with methodological guidelines for teachers.

2. METHODOLOGY FOR RESEARCH[42]

This section provides the methodological guidelines partners followed for investigating Educational Technology (EdTech) designed for collaborative learning available in the market today, doing desktop research on tools' abilities for enhancing collaboration and then proceeding on testing these abilities out in real situations in order to find which components are most useful to teachers/trainers in class to enhance the quality of the collaboration. The methodological approach includes the searching and identification of relevant tools for collaborative work, their systematic analysis, and finally a Pilot testing with main categories of users to identify the potential usage and recommendations for developing a new collaborative tool.

2.1.   Preliminary work

The main aim of project iLikeIT2 is to develop a new response technology directed towards collaboration in the learning environment. In order to do so an investigation of previous development in technology for collaborative learning was necessary. The consortium decided to test approximately fifty (50) tools already available in the market. It was designed a template for summarizing and assessing the characteristics of the tools. Beside identifying information, the designed template aims to assess each tool according to the following main criteria:

- *Functional + Usable - Ease of Use* (degree to which the tool can be used by the specified users to achieve the specified objectives): including assessment of learnability, efficiency, effectiveness and memorability of the tool;
- *Reliable - Data, Privacy & Security* (Is the solution set up to give you the data you need in a sustainable way and are you clear and comfortable with the privacy policies?): including Identity and Access Management, Data Privacy and Protection Compliance, Quality of support;
- *Pleasurable - User Experience* (how a person feels about using the tool): including Satisfaction and Social value;
- *Scalability* (Does the system has the potential to grow or be adapted to a differed need?).

In this preliminary step it was important to agree on terms to focus on, and it was decided that the research should focus on 1**) communication, 2) collaboration** and **3) coordination – the three C's**. This focus was essential to make it easy for partners' researchers to identify and separate the different pros and distinctive functionalities in the different tools. Initially the aim was to look at in-class-usage, but due to the pandemic situation, the aim was modified to also include also possibilities for enhancing collaborative work in online environments.

2.2.   EdTech tools assessment

During this step, partners' researchers surveyed the current state of the art to identify tools that had a clear potential for to be used for collaborative work. These tools have been collected mainly from partners' knowledge and expertise. This investigation resulted in a collection of nearly fifty (50) tools, including software applications and web-based environments for learning, teacher/trainer-learners

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[42] More on the methodology and interpretations of the findings can be found in the article Talmo et.al (2022). Collaborative learning using technological tools. A framework for the future. DOI:10.13140/RG.2.2.11876.04487 (preprint, to be published august 2022)

or learners-learners communication and collaborative learning. Tools tested were: Blackboard Learn, ClassDojo, Codingteam, Dapulse / Monday.com, Duolingo for schools, Edmodo, Educreations, Explain Everything, Flipgrid, Flowdock, Git, Go-Lab+Graasp.eu, Google Classroom, Google Jamboard, Google Docs, GoToMeeting, Hypothesis, Igloo, iLike, ItsLearning, Jitsi Meet, Kahoot, Kialo, Lacuna, LearnDash, Mentimeter, Microsoft OneNote Class, Notebook, Microsoft Teams, Milanote, Minecraft Education, Miroboard, Moodle, Padlet, Perusall, ProofHub, Quip, Redbooth, Skype, Slack, SMART Learning Suite/Lumio, TalkMath, TED-Ed, Trello, Turinitin, Vevox, Visme, WebEx, Wimi, Wooclap. The complete tools' assessment can be consulted through the weblink in the [Appendices](#).

Each tool was tested by one partner institution: partners analysed tools' functionalities to identify their key features and capabilities according to the assessment criteria and completed the template designed in the pre-phase in order to get comprehensive information according to the established research criteria. Additionally, one technical expert assessed the solutions for the tools to ensure quality control.

The outcome of this analysis is a comparative table for each tool that shows, at a glance, an overview of different characteristics found in each tool. For each functionality, which tools possess it and at what extent, or if they fulfil the functionality in any way at all. Table can be consulted through the weblink in the [Appendices](#).

Figure 5 - Table of characteristics existing tools for collaborative work

Consortium analysed the results of the assessment and decided to select – rather than tools – functionalities that suits the three C's in an educational tool. Indeed, partners realised that functionalities were what was important for this study, not the tools themselves, ad revised the research accordingly. Functionalities were selected based on underlying criteria connected to the intention of enhancing the collaboration aspect of a learning process and the opportunities to replicate functionalities in iLikeIT2. iLikeIT2 will be a response tool, that should facilitate for responses from many to one, as well as provide opportunities for discussions and agreeing on arguments internally in a group. Due to the international cooperation in the project, there are also some other factors that needs to be considered, more precisely scalability, cost efficiency, open access, applicability and easy to use.

Eight different functionalities were selected:

Table 2 - Functionalities identified by partners according to the 3Cs

Chat/video/recording/messaging system	Communication
Shared whiteboard/screen	Collaboration
Accumulation/internal voting/internal	Communication
Content development	Coordination
Teacher interaction	Coordination
Presentations/sharing doc internally	Collaboration
Group formation/role allocation	Coordination
Assessment/feedback	Collaboration

These functionalities had to be analysed in the next phase through Cases available within the consortium in pilot testing sessions involving students and instructors.

2.3. Pilot testing of functionalities

Pilot testing was thought as an activity in which a group of users came together and interacted in a real-life scenario of collaborative learning environment, through tools selected by the single partners and related to one or more functionalities among the eight selected in the 1st phase. Pilot testing's primary purpose was to scope out user requirements and collect input to set the performance of the iLikeIT2 software: more specifically, identifying the issues related to the use of a tool for collaborative work and to know how user-friendly and how easy a tool should be for an individual to navigate through its features.

In order to perform the pilot testing, consortium collected 15 Cases, developed based on both the level of the participants, their previous knowledge, the subject the instructor was familiar with and to ensure that participants needed to actually work together on the same task. The Cases were standardised through an Action Plan template that included information about:

- Objective of the case
- Time required to deliver the case
- Methodology for delivering the case
- How to collect data about the use
- What to do with the data

Cases were generic (related to skills) or specific (related to disciplines), in order for partners to reproduce different learning environment. To ensure the correct data being collected, and that the functionalities would be the focus point, the researchers made one subject specific case for each pilot testing.

Table 3 - Cases for pilot testing developed by Consortium

Political debate	Specific
Successful communication	Generic

Problem solving through discussions in Mathematics	Specific
Identify the grammar mistakes	Specific
Takes a stand: on-line exams for students	Specific
To create mind maps and story maps	Specific
Where do we put the immigrants	Specific
Ordinary Heroes	Specific
Math Rally	Specific
A taste of quality	Specific
European values	Specific
English test	Specific
Design and implement distance learning	Specific
Inclusion of TCN students in school	Specific
Team Formation & Role Allocation	Generic
Adapting Teaching Focus according to Assessment Feedback	Generic

The participants to the pilot testing were selected from previous experience, actual studies and/or based on previous experience, motivation and expertise. In alignment with the European Union's General Data Protection Regulation[43] and local regulations, an informed consent form was presented to participants prior to pilot testing activities to inform them of the study's data management and privacy procedures.

Pilot testings were held remotely via online tools or in presence in partner institutions. The different restrictions due to the Covid-19 pandemic at international and local level have led to this non-uniformity in implementation, but being iLikeIT2 an Educational Technology-project this was not considered to have any effect on the results of the activity: this eventuality was foreseen by Consortium and taken into consideration during the development of cases, ensuring partners could implement them in both settings with minor adjustments without affecting the case content.

Table 4 - Overview of pilot testing results

Partner	N. of pilot testing	Tool used	Functionality tested	N. of participants	Cases submitted
NTNU	2	iLike	▪ Teachers interaction	4 (students) 1 (instructor)	▪ Problem solving through discussions in Mathematics ▪ Successful communication
		Google Docs	▪ Shared document	3 (students) 1 (instructor)	▪ Identify the grammar mistakes ▪ Successful communication

MUHEC	4	Collaborative Learning Tools	• Teaching support	9 (academics)	• The role of collaborative tools supporting teaching
		Technology Assisted Learning	• Learning portfolios (GOALs) • Augmented Reality (Blippar) • Video tagging for feedback	95 (CS students) 348 (BS students)	• Second year Business School students • Final year Computer Science Students
		Teaching & Learning tools review	• Moodle	N/A (more than 200 University staff)	
		Use of Software and Services	• Whiteboards • Polls	N/A (more than 100 S&T staff)	• Use of whiteboard and polls software
FyG	2	Zoom	• Chat/ messaging system • Video/ recording/	5 (students)	• Online exams • Successful communication
		Blackboard	• Group formation • Role allocation	5 (instructors/ teaching staff)	• Online exams • Successful communication
CESIE	2	Zoom, Word online (Microsoft 365) + OneDrive	• Shared document • Content revision • Content development • Co-authoring	5 (instructors/ teaching staff)	• English test
		Zoom, Forms.app	• Questionnaire • Submission of answers in different ways (drawing, text, images)	7 (instructors/ teaching staff)	• Math Rally
ACP	1	Miro Board	• Collaboration function • Sharing function	3 (students) 2 (instructors)	• To create mind maps and story maps
Total	**7 pilot testing**			**+788 participants** • **460 students** • **+328 instructors/ teaching staff**	

National reports from the pilot testings can be consulted through the weblink in the [Appendices](#).

The Consortium planned on a double approach: (1) see if instructors/teaching staff and students had different opinions on items that were interesting for the Consortium and (2) benefit from different experiences and backgrounds by mixing instructors and students in some discussion groups. Therefore, participants selected for pilot testing were involved in:

• Questionaries regarding the tools adopted for the submitted Cases;
• Reflectional Conversations (aka focus groups) about their experience and wishes for collaborative tools and collaborative work in classes.

This two-steps process was meant to get a review of the functionalities that was as thorough as possible – based on participants' usage of the tool(s) during the case and information regarding what needs or desired tasks could not be made out through the tool(s).

2.4. Questionnaires

For the project it is important to connect both programmers, end-users and instructors. While any person may be able to express their opinion on EdTech tools' features and functions, for the iLikeIT2 purposes these categories may act as the best experts as they are able to understand the purpose behind EdTech tools and their functionalities and why they are important for their learning/teaching. Their insight can be invaluable to the Consortium as they work on future iterations of the iLikeIT2 software.

Consortium agreed on two questionnaires to be submitted to students and instructors/teaching staff taking part to pilot testing. The questionnaires acted also as ice-breaking and induction activity for the Reflectional Conversations. They allowed Consortium to get information about:

- participants' views and expectations regarding collaborative work in a learning environment,
- use of ICT for collaborative learning, including for special activities,
- matching of tools with participants' current technical infrastructure.

Due to the fact that Consortium had agreed on using Reflectional Conversations as the main tool for data collection, the Questionnaires needed to be designed in a generic way. The Questionnaires were designed in a way that should provide information for the Consortium to be aware of pro and cons with using collaborative tools in a learning environment. Mainly the Consortium was interested in two specific areas; 1) technical issues, and 2) the potential for collaboration using the tools.

It is difficult to find significant conclusions, both due to the fact that the numbers of participants are too small, but also because the participants answered according to the tool they had been using in the session, meaning there were six[44] different tools involved in the sessions altogether. Even if the Consortium used one common generic case for all tools, we also involved min. one other case that was specific for the subject being taught.

The questionnaires were made of 9 (students) to 16 (instructors) items to which participants had to respond on a Likert-type scale ranging from "Strongly disagree" to "Strongly Agree". Detailed answers given by participants can be consulted through the weblink in the Appendices.

Items for questionary submitted to students:

1. *I would like to use this collaborative tool within my courses*
2. *This tool makes learning process more efficient*
3. *This tool helps me to present written work/data*
4. *This tool helps me to create visual presentations*
5. *This tool helps me to cooperate with others*
6. *This tool allows me to work collaboratively with peers in the classroom*
7. *I can use this tool without technical assistance*
8. *I can use this tool on my usual device (laptop, mobile device)*
9. *This tool can run on my normal study-related software or application(s)*

Items for questionary submitted to instructors/teaching staff:

1. *I would use this collaborative tool within my courses*
2. *This tool matches with my teaching methods*
3. *This tool makes work with student more efficient*
4. *This tool helps me to stimulate better understanding*

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[44] MUHEC did not do questionnaires due to the large number of participants involved. The amount of data would have to massive for the projects aims, and also limited the significance of the other tools tested.

5. *Without this tool reaching the same results will take more time.*
6. *This tool helps me to present information in front of the class*
7. *This tool helps me to create/revise assignments*
8. *This tool helps me to test learners' understanding*
9. *This tool helps me to record and store lectures*
10. *I can use this tool without technical assistance*
11. *I can use this tool on my usual device (laptop, mobile device)*
12. *This tool can run on my normal study-related software or application(s)*
13. *This tool allows my students to work independently in their designated groups*
14. *This tool allows my students to solve problems set by me*
15. *This tool allows my students to work collaboratively*
16. *The tool is effective for me to communicate with my students inside the classroom*

The collected results are presented in Tables 1 and 2 below.

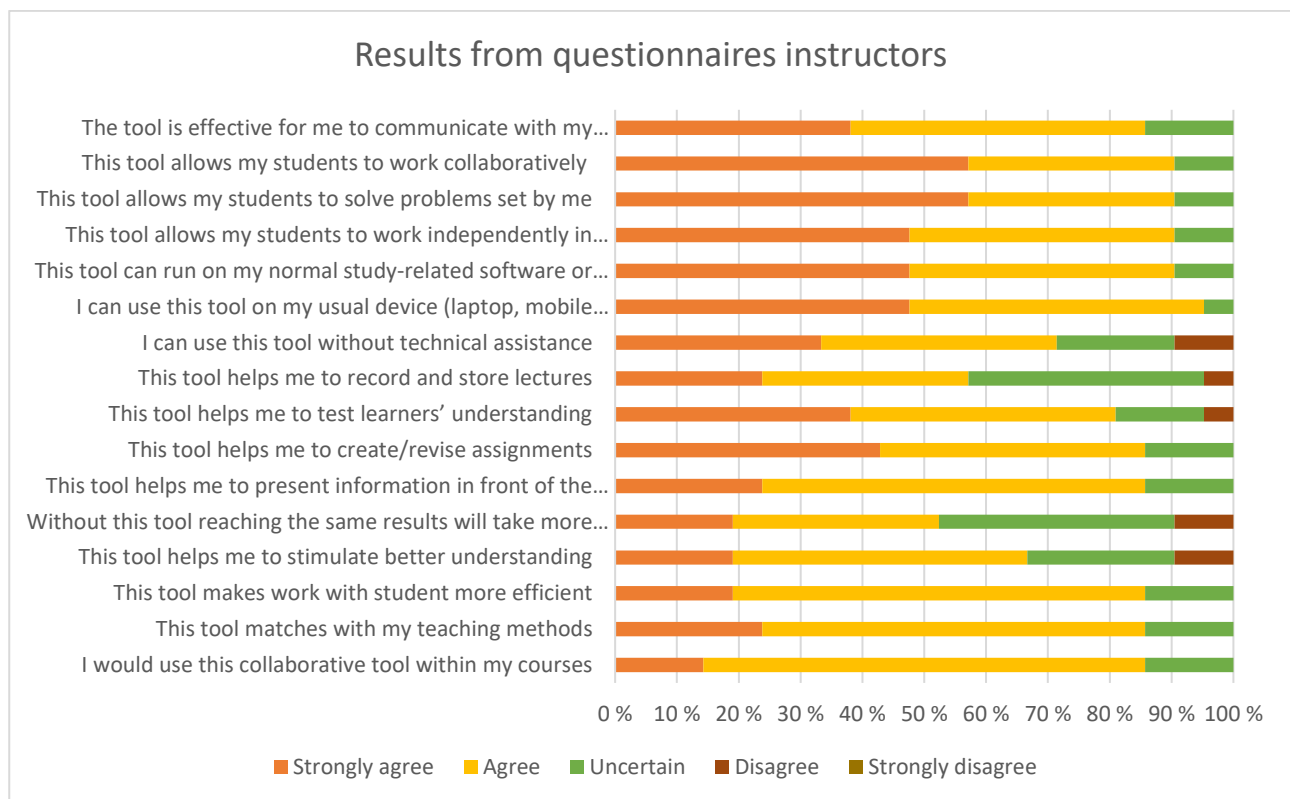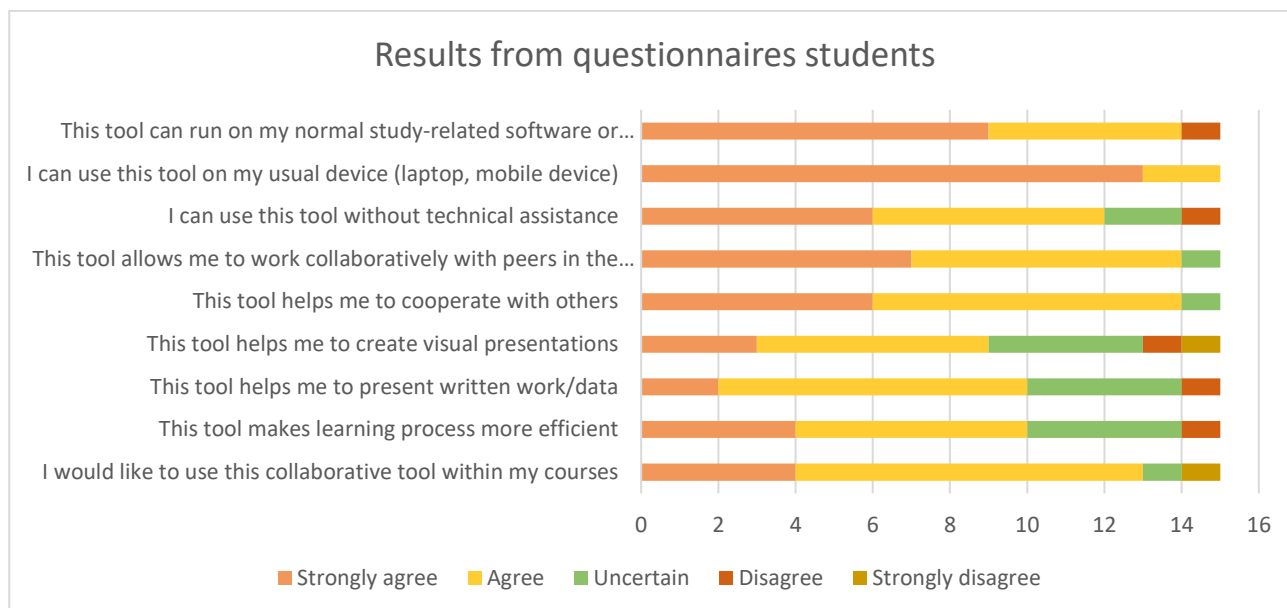*Table 5 - Results instructors (n=21)*

The first thing that is noticeable is the fact that there are very participants that disagreeing with the statements at all. This is positive, but probably as mentioned before due to the fact that the cases used in the piloting were designed for the specific tool. The places where we see some disagreement it is either connected specifically to the tool, i.e. technical issues, or as seen among instructors, the ability the tool has to enhance learning efficiently in a group.

We can see a slight difference between the students and the instructors concerning their devices to be used when applying the tool. It is obvious that students are more capable of using different educational tools on their devices than instructors. This is most probably due to the fact that instructors often are restricted by institution, government or other when installing new software. This is something the project needs to be aware of.

It is also a slight tendency that students are more positive overall to the usage of digital tools. It is clear from the conversations that this is something that needs to be addressed in the project; students expect high quality and expert usage of tools, making training important at all stages.

Another element to point out is the high percentage of agreement when it comes to the ability of collaborating via digital tools. Both instructors and students are positive towards this opportunity. This underlines the need for a good software with enough functionality to enhance this opportunity.

As mentioned earlier in the chapter it is not possible to find significant results from this survey. It is mainly an ice-breaker for the conversation as well as indications for the consortium on attitudes towards the software being made later in the project.

2.5. Reflectional Conversations

The use of Reflectional conversations is a research method that is intended to collect data, through interactive and directed discussions. As compared with a questionnaire, participants have more control in that they are able to respond to questions in greater depth, and probe awkward and sensitive issues.

Main principles guiding the Reflectional conversations were:

Table 7 - Summary of guidelines for Reflectional conversation

	How?	Why?
Moderator/ facilitator	Dual structure	One person ensuring that smooth progression of the session, while another took notes and ensured that all the topics were covered. The instructor to provide valuable insight to the case.
Structure	Semi-structured	The conversation has an aim, and it is necessary to not let the group deviate significantly from it. Participants were urged to discuss freely.
Settings	Formal	Part of a lecture in some cases. Needed to be recorded and transcribed.
Communication	Flexible	Balancing act between flexibility, allowing a free-flowing conversation, and structure, ensuring that the conversation did not stray too far from research objectives. Flexibility allowed a larger number of responses from all participants.
Cooperation	Equality of contribution	To encourage equality of contribution. Moderation between introvert/extrovert persons. Allowed instructor to participate without dominating.
Expressions/ Limitations	Personalized	Subjunctive meanings are interesting in this study. Discussions, disagreement were welcomed and the facilitator moderated for such.
Timeframe	30 min.	It was foreseen that participants might be tired if the conversation lasted for longer than 30 minutes. Still, if interesting discussion and engagement, this was not a maximum.

As for the organisation of pilot testing, Consortium agreed on the following setting and provisions:

Table 8 - Agreed setting and provisions for Reflectional conversations

Modus	Small focus groups of 5-10 participants
Participants' profile	▪ Instructors/ Teaching staff: Lecturer and senior lecturers, Trainers, Learning support workers, Academic developers ▪ Technicians ▪ Students
Equipment	Case work plan, equipment to test the tools (laptop, tablet, smartphone) + tools to be tested
Time limit	Between two and three hours for the whole pilot testing including questionnaires and reflectional conversation)
Pilot settings	▪ Groups of minimum 4 or five participants, with one facilitator running the cases. ▪ 1 facilitator to observe the collaborative work ▪ Additional technician to ensure that the tool functions if needed
Requirements	For recording of Pilot testing Partners had to comply with national and institutional law regarding privacy protection. Participants were requested to sign a statement of consent.

Pilot workplan	▪ Preparation: Participants provided with all the necessary information regarding the project and the activity: aim of the pilot testing and what participants had to do during the testing period, accurate description of the chosen tool and case and intentions regarding the expected final result. Lastly, a time limit was provided for carrying out the chosen cases' single tasks or main activity to participants for the test.
	▪ Deployment: Ensured that all the participants have understood the project's goals and the activity basic working, proceed on working on the chosen case with the tool required to be tested.

To mitigate potential variations in answers, a very detailed and structured research process 'script' and procedural directions were developed to enhance homogeneity and coherence in conversations and data analysis, but leaving room for ingenuity and flexibility. As for the script, Consortium agreed on the following research questions:

1) *Describe a normal setting for collaborative work in your learning environment?*

2) *What helps you to use collaborative tools effectively in your teaching?*
   a. *Perceived usefulness - Degree to which they believe that using a particular technology would enhance their job performance: Work more quickly? Improved job performance? Increased productivity? Effectiveness? Useful?*
   b. *Perceived ease-of-use - Degree to which they believe that using a particular system would be free from effort: Easy to learn? Clear and understandable? Easy to use? Controllable? Easy to remember?*
   c. *Attitude toward use – teacher's positive or negative feeling about using the tool*
   d. *Behavioural intention - The degree to which the teacher has formulated conscious plans to use the tool*
   e. *Social influence processes*

3) *Do you have any advice for those who would like to use collaborative tools in their courses?*

4) *Which functionalities are working according to the intention of the case?*

5) *What functionalities of the tools do you consider to be important and useful for collaborative work?*

6) *Identify the limitations of the tool according to the intention of the case?*

7) *What challenges do you see in using this tool for collaborative work?*

8) *What functionality do you miss? Is there any function that you wish you could use in your courses?*

The guidelines document contained information about the main themes, useful directions for the implementation of the conversations, instructions for the initial data analysis and a template grid for data insertion from all partners. Procedural directions provided to efficiently set the environment and lead conversation included:

Table 9 - Summary of procedural directions for Reflectional conversation

Setting the scene and Getting to know each other	Welcome participants, set a pleasant and open environment, providing a brief introduction outlining the purpose of research, introductions

Laying ground rules	Setting and ground rules for conversation, privacy and confidentiality
Introducing a theme that needs to explored	Opening topic/question, generating discussion, ensuring everyone contributes.
Discussion	Ensuring all points are covered, promoting group discussion. Intervening if the discussion in moving towards a side-track or stops entirely.
Introducing another theme that needs to explored	Proceeding with script, reading the participants.
Ending the discussion	Stating of individual final positions on key topics, additional comments.

All interviews were performed in local language. Data from the reflectional conversations were captured in different forms as the basis for analysis to enhance accuracy and reliability: Consortium relied on video/audio recordings, transcripts, abbreviated transcripts, notes and memory of facilitators and researchers. Each of these provides a different level of specificity, detail and completeness, and ensured the highest level of detail for quality analysis.

The results from the reflectional conversation were collected by each Consortium partner in the provided grid, which was focused on six main thematic areas:

- Normal setting for collaborative work
- Effective use of collaborative tools
- Advices
- Working functionalities
- Limitations/ Challenges
- Needs / Wishes

Consortium partners – except Middlesex University – followed the guidelines, and analysed the collected data by creating sub themes under each main theme. The partners reported their findings in the grid, mentioning the main themes, sub themes, specific statements from the participants for each sub theme and any comments they needed to add.

The translated transcripts and grids shared among the Consortium were complemented with a short summary providing:

- a Report of the activity (including information about setting, timing, tools used, functionalities tested, participant profile),
- Observation from researchers/facilitators,
- Sources of errors,
- Main statements from participants regarding the functionalities.

2.6. The pilot studies of MUHEC

As an institution with vast experience in computer supported collaborative learning Middlesex University (MUHEC) has in place an integrated online platform called UniHub that allows access to more than 20 systems used by both its students and staff. The available functionalities include a virtual learning environment (Moodle), a content management system (SCATE), student records (MISIS) and a wide range of assessment tools. With regards to assessment, MUHEC has in place

its bespoke, in-house developed assessment platforms (GOAL and SOBS) but also supports staff who use a range of off-the-shelf solutions such as Socrative, and Kahoot.

The iLikeIT2 research attracted a great interest from internal staff and students, thus a revised methodology was applied. Numbers of people involved were too high and MUHEC has attempted to conduct a combination of qualitative and quantitative collection of primary data based on its prior experience with collaborative learning technologies. Most data were collected through four insightful pilot studies including surveys and focus groups.

The MUHEC team collected information with regards to the role of educational technologies in learning enhancement by using a variety of data collection techniques:

- Collaborative Learning Tools – this was a focus group workshop that attempted to reflect on how key staff members, representing different departments from the Faculty of Science and Technology use certain tools for various tasks associated with teaching, learning and assessment.

- Technology Assisted Learning – this was a survey on the role of technology in enhancing learning experience that spanned across students of two modules delivered to the second year of the Business School and the third (final) year of the Computer Science Department. Both modules are offered to multiple programmes. The student survey was completed by 95 final year students of whom all but one had prior experience in working with student group projects.

- Teaching & Learning tools review – this was a series of four focus groups that were organised centrally by the University, with the results being shared with the iLikeIT2 MUHEC team focusing on functionalities offered by the institution's virtual learning environment and their effectiveness for teaching and learning.

- Use of Software and Services – this was a survey led by the Head of Learning, Teaching & Student Experience in the Faculty of Science and Technology, focusing on the use of whiteboards and polls tools amongst staff.

3. FINDINGS AND RECOMMENDATIONS

3.1. Findings

3.1.1. Results from Reflectional conversations

The Reflectional conversations results analysis had for objectives:

- Understanding how participants view the topic of collaborative learning,
- Discovering the factors that prompts people to modify or change their views,
- Identifying change or movement in opinions, preferences and attitudes,
- Identifying events, actions, or situations that were influential to individuals or organisations,
- Identifying patterns in the data, and discover relationships among idea or concepts,
- Identifying important ingredients relates to success or failure of a collaborative tool,
- Identifying the most preferred choices among alternatives.

The grids of the Reflectional Conversation conducted by each Consortium partner can be consulted through the weblink in the Appendices.

A synthesis of the partners' collected data was conducted. For each main thematic area of the reporting grid, sub-themes were identified from participants' statements and organised in theme clusters and are presented below.

a. Normal setting for collaborative work

Tools support teaching process	Tools support learning process	Tools are a must	Choice of the tools
▪ Tools support clarification of concepts and demonstrations ▪ Increased productivity and time efficiency ▪ Tools allow monitoring of learners' work	▪ Tools make learning more dynamic and stimulating ▪ Learners develop team work skills (to communicate, to divide tasks, to delegate) more easily ▪ Tools bring gamification elements in learning	▪ Tools are essential in distance learning ▪ Teaching staff is called upon to keep up with modern ICT ▪ To use the same tools in class and in distance learning	▪ Suitability depends on target group characteristics and approach to learning ▪ Teaching staff rely on what they know best

Many of the participants considered collaborative work as an optimal method to promote deeper, active learning through doing. Collaborative tools not only increase productivity in teaching process and helps students to be actively engaged in building their knowledge, but they foster the development of additional skills. For example, a trainer from the Active Citizens Partnership (ACP) group said: *"… In the end, if there are some disagreements and differences, they can come to an understanding there among themselves and find a solution more comfortably and directly."* And a

student from the Norwegian University of Science and Technology (NTNU) focus group indeed recognised that: *"… everyone participates equally… and contributes equally."*

Participants talked about the use of collaborative tools becoming more and more frequent, varied and complex in class and distance learning, especially after the COVID-19 pandemic started, and that teaching staff needs to consider them when designing collaborative activities. As one trainer from the ACP group said: *"… we are all called upon to keep up with all these modern media, because the learning environment is becoming more modern."* As for distance learning, tools improved delivering of lessons, and are deemed as essential because formal lesson does not work on a videoconferencing tool. As one Instalofi Levante SL (FyG) participant said: *"the level of concentration is not the same as when you have them 2 metres in front of you. You don't interact in the same way, so there is communication that is lost, so you can't transmit in the same way."*

b. Effective use of collaborative tools

Delivery	Interaction	Communication	Collaboration	Coordination
▪ Sharing screen (displaying contents, weblinks, etc.)	▪ Monitoring of learners' work	▪ Instant communication	▪ Shared whiteboard	▪ Tools allow to include both individual and group work
▪ Archive (always updated)	▪ Recording of lessons/ training session	▪ Learners directly ask teacher for clarification without others knowing	▪ Comments in text	▪ Grouping (randomly, specifically)
▪ Tools provide micro-activities which make the lesson more engaging	▪ Hiding/revealing answers	▪ Messaging system	▪ Post-it and word clouds for input collection and brainstorming	▪ An in-lesson evaluation is more effective than an ex-post evaluation
▪ Tools with simple access/registration process are preferred ▪ Learners are more engaged when using their own devices	▪ Getting/providing immediate feedback			

Participants talked about their experience with collaborative work through tools. They considered tools important because they brought many new opportunities for a multi-layered learning experience. The different mentioned functionalities (present in a specific adopted tool or in multiple tools employed in a teaching activity) allowed teachers to deliver contents in multiple formats (for the students to access a format that better match their learning style), but also to engage students in research, discussion, debate and create an environment where they can work together to study and explore a topic, solve a problem or create a project. For example, a participant from the NTNU focus group said: "*So, in a way you got both parts of group work, but you also had some peace and quiet to work individually and you could then have a discussion based on what you did individually."*, while another participants told*: "I think it made it clearer what everyone was supposed to do. I could see what she was doing, what he was doing, and if there was something to discuss, then we could communicate instantly. So, in a way, it just happened naturally, as equals."*

Also, the possibility for the teaching staff to actually monitor students' work and collaborative dynamics more closely was stated: participants from FyG focus group said *"You can do a more continuous monitoring of the class"*, "*especially, the daily control of the work they do. In class we don't have time to look at all the notebooks"*. A participant from NTNU group focused on each student taking responsibility for collective learning: *"No one can skip their part since everyone was assigned their specific part. If something was done, then the others on the group knew who hadn't done their part."*

c. Advices

Teachers' preparation	Learner support	Communication
▪ Consider learners' characteristics in designing lessons ▪ Ensure that the technology used matches the learners' devices ▪ Do not use tools just for the sake of it ▪ Find best practices in the tool or from peers ▪ Try the activity beforehand	▪ Explain how to use the tool to learners ▪ Pay attention to user-friendliness of the tool ▪ Find a tool including multiple functionalities you need ▪ Have a plan B	▪ Q&A between learners and teacher need to be enhanced (current systems are not suitable) ▪ Audio chat

Since learning can be meaningful only when the process is attuned to the needs, goals and strengths of a learner, participants recognise the importance of considering learners' characteristics in choosing a collaborative tool. Participants from CESIE focus groups discussed differences in adult and young learners, recognising how the approach to learning and the level of computer and digital literacy affects how a collaborative tool can be efficient. As for other focus groups, the importance of educating learners to the use of a tool is stated: *"I thought was very intuitive, but activity was difficult, some students could not understand how to use it.", "Even when a tool seems easy, you must explain it to students. What is intuitive for you, may not be for others.", "I learnt to devote time to explain the tool, even for those which seems very easy to use."* (IT trainers)

d. Working functionalities

Delivery	Interaction	Communication	Collaboration	Coordination
▪ Sharing resources (diagrams, documents, videos) ▪ Functionalities to act again misuse and disruptive behaviours of learners ▪ Monitoring connection	▪ Getting overview of learners' knowledge ex ante and ex post ▪ Getting/providing immediate feedback ▪ Monitoring learners' in real-time and ex-post	▪ Messaging system	▪ Shared whiteboard ▪ Role and task allocation ▪ Input collection and brainstorming	▪ Tools allow to include both individual and group work

Participants endorse the idea that technology only makes collaboration easier. Most participants from all groups expressed largely positive connotations regarding grouping and role allocation and monitoring. These are the most appreciated functionalities in a tool. As one participant from NTNU said about teacher view: *"Yes, it is the only way to get an overview of the student group's knowledge.".* About role allocation, a participant from ACP stated*: «...it helps everyone to distinguish which goal they should do. That's the key feature that helps in this industry, this application... That is to identify everyone's goals, for example everyone should do this part of the project, if it's a team project."*

e. Limitations/ Challenges

Delivery	Interaction	Learner support	Collaboration	Coordination
▪ Challenge: Adult learners prefer quick and simple tasks	▪ Challenge: how to be sure you are interacting with your learners? (name changed, camera off)	▪ Limitation: Time devoted to explain how to use the tool	▪ Challenge: performance comparison could be demotivating for some learners	▪ Limitation: teaching staff need to master the tool to not waste time in setting
▪ Challenge: tools do not match all subjects (ex. Maths)	▪ Limitation: different technology/tool version in learners' devices	▪ Challenge: low ICT skills/ digital literacy	▪ Limitation: you need multiple tools to get all functionalities you need for your lesson	▪ Challenge: teaching staff need to be knowledgeable about tools and their functionalities (do research, compare, test)
▪ Limitation: in tool selection, need to balance among Visuals/ Efficiency/ Expected results ▪ Challenge: feedback and results need to be clear (visuals)	▪ Limitation: be aware of who is present/leaving	▪ Challenge: avoid misuse and cheating		
▪ Limitation: in most tools teaching staff need a paid account to have more functionalities				

Participants also reported a feeling of frustration coming from the time spent in lesson/activity preparation. As group work need to be carefully structured to achieve specific learning outcomes, so collaborative tools' functionalities are to be set to match these learning outcomes and teaching staff's expectations regarding the learning process; plus, instructions and activity directions are to be well given. Designing collaborative work through tools take more planning time.

The participants also talked about the challenges they face mainly in the area of distance learning. Not being able to see learners' face (because cameras are off or not working) make it more difficult, for both instructors – who do not know if learners are following, or even present – and students – who find interaction with their peers or teaching staff difficult. For example, a trainer and a student from the FyG focus group respectively said: *"you're not seeing their faces. You don't know if they're*

really understanding it, if they're not understanding it." and *"… it was very awkward, because all the cameras were turned off, so you didn't see anyone, you just saw the teacher or even the teachers didn't even turn on the camera and it was like very strange…"*

It seems like all groups are in line with the issue of required subscriptions and fees to benefit from tools' functionalities. Having free accounts for the tools is a problem for most users: these limitations are often not clearly explained and as a participant from ACP said: *"You must be careful, because not realizing that it's free...you start organizing your work, writing things and suddenly after 7 days you get a notification and saying that in order to continue you have to pay a subscription and basically the work you've done, is wasted. "*

f. Needs / Wishes

Delivery	Interaction	Learner support	Communication	Collaboration	Coordination
▪ Split screen	▪ Knowing from which devices / tool's version learners are working	▪ Layout customisation	▪ A functionality for Q&A, for teaching staff to answer question by question	▪ Compare answers from groups	▪ To have just one tool doing multiple things
▪ An appealing graphic	▪ Have a tool adapted for collaborative work from different devices		▪ Allow uncertainty / no answer	▪ Input collection	▪ Assessment (quiz, questionary, time-based challenges)
▪ Timer	▪ Monitoring of process and results for reporting/ feedback		▪ In-screen questions	▪ Shared whiteboard, a shared space where to act together	▪ A wider pool of activities (drag&drop, fill in the blanks, image pairing, sequencing, timeline)
▪ Simple access/ registration process	▪ Get information about learner's engagement		▪ Knowing who answered right/wrong		▪ Performing different tasks in the same activity

As for participants' wishes for a new tool, they reported all functionalities they appreciate and need the most in their teaching/learning experience. There was much convergence in the views expressed by the target groups: what emerges is the general need for ONE FREE COMPREHENSIVE tool allowing a more direct interaction among peer learners during collaborative work and with the teaching staff.

3.1.2. Results from Middlesex University pilot studies

MUHEC pilot studies included:

(i)   a student survey on the role of technology in enhancing their learning experience,
(ii)   a focus group between academics on the use of polls,

(iii)   a series of focus groups on the features of virtual learning environments, and

(iv)   a survey on academic staff using educational software.

a. Collaborative Learning Tools

A workshop on '*Features of Live Polling to promote engagement in SAT disciplines'* was organised as a focus group with key staff representatives. The focus group covered the Faculty of Science and Technology and attempted to get participants from a wide range of roles. The session participants included the Head of Learning, Teaching & Student Experience in the Faculty of Science and Technology, Professors from three different disciplines, Directors of Programmes from two departments, and representatives from Programme Leaders, Module Leaders, Academics, Associate Lecturers and Graduate Academic Assistants, as well as different roles from the institution's Centre of Academic Practice Enhancement.

The session focused on six issues associated with collaborative learning support from technology and the facilitator used the following questions:

1) *Describe a normal setting for collaborative work in your learning environment?*

2) *What helps you to use collaborative tools effectively in your teaching*

3) *Do you have any advice for those who would like to use collaborative tools in their courses?*

4) *Which functionalities are working according to the intention of the case? / What functionalities of the tools do you consider to be important and useful for collaborative work?*

5) *Identify the limitations of the tool according to the intention of the case / How can this tool better match your teaching methods? What challenges do you see in using this tool for collaborative work?*

6) *What functionality do you miss? Is there any function that you wish you could use in your courses?*

It appears that the majority of responses focused on the support required for group work and perhaps presentations, as well as demonstrations and brainstorming. The role of technology in group work was emphasised, as during the COVID19 pandemic this was a key area of learning that was affected. Furthermore, the participants seemed to adhere to the factors affecting the effectiveness of collaborative learning tools as identified by Venkatesh and Davis (2000), including:

(i)   external variables (such as limited accessibility and network connection, limited ICT facilities and/or technical support, lack of effective training and lack of teachers' competencies),

(ii)   perceived usefulness (such as degree to which staff believe that using a particular technology would enhance their job performance),

(iii)   perceived ease-of-use (such as the degree to which staff believe that using a particular system would be free from effort, easy to learn, clear and understandable),

(iv)   attitude toward use (such as teachers' positive or negative feeling about using the tool),

(v)   behavioural intention (such as the degree to which the teacher has formulated conscious plans to use the tool) and

(vi)   social influence processes.

The group suggested that the most suitable way to utilise collaborative learning tools should be based on identification of suitable scenarios. This reinforced the iLikeIT2 plan to create a repository of teaching cases for the use of its collaborative learning software functions. The group also

focused on the need of students to receive support while working on their ablets or phones, as well as quizzes that help them to boost their confidence. Again this was in line with the hypotheses made in the iLikeIT2 Consortium with regards to the tool's core functionalities. The main concern of the group was the tool's ability to support different screen sizes, interfaces and platforms. This was also anticipated by the consortium, hence the use of an open-source technology that would enable the development of an adaptive and scalable collaborative learning tool.

b. Technology Assisted Learning

The second pilot involved a study on how students perceive the effectiveness of Technology Assisted Learning. Emphasis was given on the support involved (i) using the Graded Observations of Assessment and Learning platform towards student assessment, (ii) using he Augmented Reality tool Blippar as guidance on relevant content, and (iii) using video tagging for presentation feedback. These tools were part of the module's Technology Assisted Learning approach that involves the use of student profiling, augmented reality, biometric data collection with the use of sensors, video tagging, and learning analytics. The evaluation consisted of the following sections:

- Student Information
- Prior learning experience
- Use of GOALs
- Use of Blippar
- Use of video tagging
- Use of assistive learning technologies
- Role of learning analytics

In total 95 logged responses from the final year students and 68.4% of them provided the maximum response of 10 for the importance of feedback for their learning. More than 97% of the participants rated the importance of feedback as 7 out of 10 or higher. More than 70% of participants agreed that the assessment tool based on gamification and ranking visualisations supported them to reflect on their own progress in comparison to rest of the class.

From the 348 second year students, more than 60% agreed that the use of the AR tools helped them with their own performance during the lab sessions but also while preparing their reports. Although there is a significant proportion of students who did not use the technology due to their limited experience in using similar tools, they indicated a neutral response to the usefulness of the application with only 10% of students feeling negative. Similarly with video tagging tools for providing group presentation feedback, half of the class used the tool for improving their delivery, and around 40% did not use the technology, while around 6% found the technology difficult to use and disruptive. It was evident that students of certain backgrounds needed training and onboarding before using such technologies.

It was of particular interest to observe how almost three quarters of the students agreed or strongly agreed that their ability to view their contribution to the group work would work as an incentive to increase their participation in collaborative learning tasks. Less than 5% of the students responded negatively to this question.
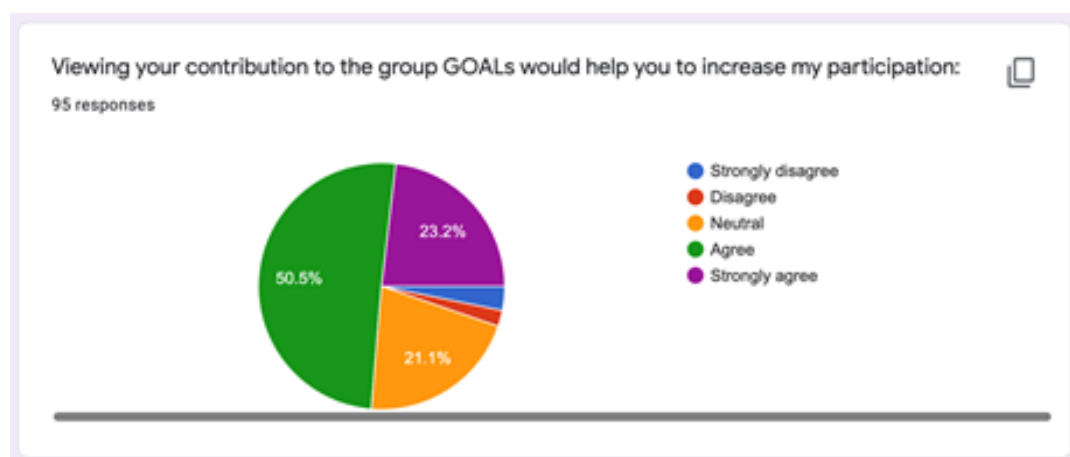
Figure 6 - Answers to MUHEC survey question regarding ability to view personal contribution as an incentive to participation

c. Teaching & Learning tools review

The institution's Centre for Academic Practice Enhancement (CAPE) undertook a review of the virtual learning environment to reflect whether it is fit for purpose and that it can continue to support our learning and teaching. Emphasis was given on understanding and documenting the current user experience and future expectations of both staff and students and develop a set of recommendations. In total four focus groups took place organised under the following themes:

- Navigation and User Interface (User Experience)
- Cohort and Programme identity
- Communication
- Collaboration
- Assessment

It became apparent there was a need for simplicity with regards to the functions provided to academics. There were also requests for clarity of tasks and possible issues with the institution's approach to enforce a consistent layout that for some modules it was perceived to be unnecessarily detailed. Academics also needed further support with integration issues, such as when Kaltura videos were uploaded. The need for simpler navigation was also mentioned by a few academics. Although communication issues were not reported at large scale, cohort identity does not seem to be supported by the virtual learning environment, unless module leaders attempt to provide additional information and events for their students. Moodle was criticised for lack of supporting tools for student collaboration (e.g. Miro was mentioned as an alternatives). The need of various training topics was also emphasised. It was evident that Moodle could be enhanced by using bespoke features and tools created for specific modules. The critical role of whiteboards and polling in collaborative learning was evident.

d. Use of Software and Services

Following the review of the Moodle platform, the iLikeIT2 Consortium accessed a review of whiteboard and poll effectiveness conducted by the Head of Learning, Teaching & Student Experience in the Faculty of Science and Technology. The survey included faculty staff focusing on assessing software/services currently being used for teaching with regards to:

- Usage
- Licensing
- Importance for teaching

- Student impression

Particular emphasis was given on virtual whiteboards and polling software under two scenarios as follows: (i) scenario 1: some remote teaching required and (ii) scenario 2: full return to campus. From the respondents it became clear that two thirds of staff were using either whiteboards or polls. More specifically 23 staff were using both, 40 staff were using only polls and 17 were using only whiteboards. Some of the most common polls included Kahoot, Mentimeter, and Newrow Polls. Whiteboard solutions included Doceri, MS Whiteboard, Miro, and MURAL. The iLikeIT2 Consortium used this list as a guide to review the available features and functionalities of the polls used. The staff perception on whether students like the use of these tools seems to advocate that the vast majority of the students liked the use of polls such as Zoom polls, Kahoot and Vevos in that order.

The staff survey also provided some useful findings as the use of polls was perceived to be essential or very important from most academics for both scenarios either maintaining remote teaching or returning to campus after the COVID19 pandemic. The role of polls was perceived to be more important in the event teaching had to remain online. The poll software of choice depends on the platform preferred by different departments, therefore the most popular choices included Zoom polls, Socrative, Kahoot and Vevox.

3.2. Interpretations and Recommendations

Good software development starts with building a clear understanding of the problem to solve. The tools assessment, the functionalities testing and the reflectional conversations carried out in partner countries allowed the Consortium to better understand the root problems impeding collaborative work in class and avoid jumping to a solution based just on preconceived biases and personal views and experience.

During the interpretation of the conversations in all partner countries, the researchers identified 28 areas that must be considered when designing and using educational tools to enhance collaborative learning in the learning environment. Table 7 shows an overview of the different areas identified, with a short explanation to each of them based on input from the reflectional conversations. The table is sorted according to the six categories found in the CSCL framework[45]. The descriptions of the areas are interpreted from a synopsis of different statements from both students and instructors during the conversations.

Table 10 - Areas identified as essential for making collaboration better when using EdTech.

CSCL categories	Areas of interest	Description
Delivery	**Time efficiency & control**	The instructor's ability to monitor the work being done and the time saved when delegating tasks and groups.
	Split screen	Possibility of sharing multiple content at the same time.

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[45] Knutas, A., Ikonen, J., Porras, J. (2019). Computer-Supported Collaborative Learning in Software Engineering Education: A Systematic Mapping Study. International Journal on Information Technologies & Security, 7(4)

	Visuals	Results need to be visualized in a clear and appealing fashion for the plenary/group.	
	Dynamics	The ability the tool provides for organization and creation of continuous work.	
	Misuse	The tools need to be used for the intention, not for everything else, i.e. laziness from the instructor, private chats, games or similar.	
	Cost & fees	Important that the tools deliver what you expect them to do, indifferently the cost and/or fees being paid.	
	Connection	All technical solutions need to be secure and available, like internet connection and AV-equipment, as well as an easy access/registration for all participants.	
Interaction	**Recording**	The ability to record the session, allowing both students and instructor to watch the session post activity.	
	Learning effect	The opportunity to increase motivation and provide immediate feedback on tasks.	
	Responsibility	The possibility to monitor and access the peers work, thus making responsibility for the tasks clearer.	
	Teacher view	The instructor is allowed easy monitoring and access to all aspects of the collaborative work, in real time and after ended task.	
	Statistics/results	Both displaying results immediately and saving statistics for later discussions.	
Learner support	**Initiation**	The ability of instantly getting into interaction and in-depth learning.	
	Preparation	Easy to understand for the students, and abilities of preparing for different scenarios	
	Control system for the moderator	The ability of customization. Also important to monitor and moderate misuse.	
	Learning design	Clear guidelines and explanation of the task. Needs to be available in the tool somehow.	
Communication	**Sharing**	The ability of not being physically present to attend and contribute in a collaborative work.	
	Communication	The possibility of exchanging ideas and discuss during the task, written or orally.	

	Regularity	Both students and instructors need to be used to the tool and methodology.	
	Messaging system	The ability of answering specific messages and create new threads of communication.	
Collaboration	**Peer learning**	The idea of students helping and aiding each other.	
	Collaboration.	The ability to communicate efficiently and interact with other members of the group, both for students and instructors.	
	Indicating uncertainty	The ability to show the group and/or instructor uncertainty with the answer or disagreement with the groups result.	
	Roles	The possibility of selecting a "leader", and to identify who is responsible for each task.	
Coordination	**Collaboration/ Assignments**	The ability of creating both individual and collaborative tasks. Allowing the instructor to easily change between the two according to the learning design.	
	Coordination	The ability to delegate tasks, store materials and work simultaneously in the same task.	
	Grouping	Allowing flexibility when dividing in groups.	
	Teachers' preparation	Instructors needs to be prepared, both for the methodology, but also for the possibilities the tools allow for.	

The 28 areas identified through this research set the basis for the development of the iLikeIT2 software.

Collaborative tools enhance productivity and creativity of students, getting them to share and collaborate on projects, give and take feedback, brainstorm, research and create contents, or just discuss better. Combined with a suitable methodology for collaborative work and teachers' efforts and skills, they really can make the difference in the learning process and lead to better knowledge and skills building.

3.2.1. Implications of the conclusions for the iLikeIT2 software

It can be seen that just gathering the requirements already created a huge list of features. In order to simplify the development process, it would be better to start from a simple software, and have partnership organise functionalities according to whether they are the most important, high-value additions, or nice-to-haves. This way development team can focus on achieving the most critical objectives, working their way down the list as time and resources allow.

As first operating principle, Consortium agreed on starting as simple as possible: as a way to build faster and improve chance of success, **for iLikeIT2 development partners agreed on not**

developing the codebase structure from scratch but instead using open source code, combining and modifying a reliable and secure existing software to achieve a new result. Choice fell on **Jitsi Meet**, an Open Source WebRTC JavaScript application which empower users to use and deploy video conferencing platforms with state-of-the-art video quality and features.

This choice allows software developers to save time usually invested on solving setup and maintenance problems and instead focus on delivering actual value by fitting the requirements from final users collected during the research and solve the problems on the way.

Referring to the 28 areas identified in the research, the iLikeIT2 software development will focus on:

CSCL categories	Areas of interest	Development potential How iLikeIT2 take these areas into account?
Delivery	**Time efficiency & control**	The instructor will have the possibility to monitor participants online and assign time for polls.
	Split screen	This can be done by allowing the instructor to make questions up-front and store them.
	Visuals	With the Presenter Mode, iLikeIT2 supports screen sharing with other users. Participants can either share a full screen, a particular window, or a particular browser tab.
	Dynamics	With regards to this project the split screen may be used occasionally to further clarify the topics assessed in an online quiz.
	Misuse	The poll results will be part of the dashboard shown to participants. Results will be visualized for the plenary/group.
	Cost & fees	iLikeIT2 enables dynamic team formation by allowing to add and remove members from teams prior to conducting a poll.
	Connection	iLikeIT2 provides a range of functionalities that can be used to support collaborative learning. It is the responsibility of instructors to maintain control of interactions and enforce an agreed etiquette.
Interaction	**Recording**	None.
	Learning effect	Jitsi was selected as it provides an open source platform that will not restrict future changes.
	Responsibility	The use of iLikeIT2 requires instructors to be registered. There is no need for student registration as they join a thin client of the platform using a web browser.

	Teacher view	Secure connections are established as part of the Jitsi connectivity. Participants need to ensure that they do not access the system from insecure connections. They must also ensure that their computers are not infected by viruses or they have not fallen victims of phishing or malware attacks prior to an iLikeIT2 session.
	Statistics/results	With regards to GDPR, as iLikeIT2 does not require student registration there is no collection, storage or handling of personal data. Participants can be identified only if they provide their full name or other credentials when joining the session.
Learner support	**Initiation**	iLikeIT2 has inbuilt recording and streaming facilities.
	Preparation	Motivation is achieved by immediate access to the model answers and poll results, as well as the ability to discuss the results with the instructor and peers. Feedback is provided as a set of correct answers, reflection on own score and the score statistics for the specific questions.
	Control system for the moderator	The formation of teams enables their members to discuss each question before providing their own answers, enabling complete transparency of the logic behind each answer.
	Learning design	Instructors can manage team formation, create poll questions, organise questions in a complete poll and assign specific questions to individual students.
Communication	**Sharing**	The results of each session are demonstrated to participants, whilst answers to each question are aggregated to provide overall statistics for each poll question.
	Communication	iLikeIT2 is easy to use and requires little-to-no onboarding.
	Regularity	Jitsi does not have any overheads for different scenarios, as instructors can either use pre-determined questions or create new ones on the fly.
	Messaging system	Based on the first results, the instructor can easily make a new question on-the-fly.
Collaboration	**Peer learning**	Instructors have the responsibility to monitor the communication tools (e.g. chat) and act accordingly in cases of inappropriate input from participants.
	Collaboration.	Instructors have access to all group chats thus allowing for moderation.
	Indicating uncertainty	Instructors can display additional information guiding participants to each poll or learning task.
	Roles	iLikeIT2 is a platform supporting collaborative learning, and sharing of ideas.

Coordination	Collaboration/ Assignments	iLikeIT2 is web-based so participants may access as long as they have an internet connection.
	Coordination	iLikeIT2 supports synchronous and asynchronous discussions, as well as audio and video exchange.
	Grouping	iLikeIT2 will provide the possibility of communicating in written language in the software.
	Teachers' preparation	The platform will be demonstrated as part of an onboarding activity to all participants and a series of short videos will be used with supporting training procedures on the different functionalities of iLikeIT2.

Complexity is the main limit of a software: the bigger a software's codebase, the more problems rise when a new feature is added. iLikeIT2 Consortium's main concern must be to not reach the point where the work to fix new problems is more than the work for the feature development and addition. Therefore, Consortium will rationalise their work and try to expand the codebase till it stay stable and practical problems are easy to be solved.

4. BEST CASES-EXAMPLES

4.1.   Methodology

In this section the Consortium will report on the Case Work being done so far in the project. It is always necessary to include good cases in order to test software, to ensure that one gets the maximum effect from the software. The Cases need to be based on pedagogy, levelling and learning objectives that feels important for the participants. And in a technology-enhanced environment the tools included needs to be in such a manner that they enhance the learning effect from a conservative way of working with the materials. In this project it is also essential that the cases include collaborative elements.

Based on the pilot testing and the findings from the research being done, the Consortium has highlighted some of the cases being discussed and used throughout this phase. The Cases are here to explain how and why one should do something like this, and what you can achieve from it.

(i)   The first phase of testing included discussion in the Consortium on what should be emphasized and included in the Cases. The main aim for this phase was to create Cases from different levels of the educational system, that included several functionalities and different subjects.

(ii)   The second phase of the Case Work included pilot testing in actual groups and with tools selected for the purpose. The results from the pilot testing are reported earlier in the report. Based on these results and the feedback from instructors, the Consortium refined and adjusted the cases.

(iii) The third phase of the Case Work is what is being presented here. The project wants to provide cases that in- or experienced teachers may use directly when applying digital tools in their learning environments. There are several elements included in the Cases, but mainly it is presented in a way that allows the single teacher to adjust and adapt in a manner that suits the progress, pedagogy and levels which is suitable for them.

4.2.   The outline

The Cases include two sections: a General Description and the Case itself. In the following each category is explained.

1) The description includes the following elements:

Level	Project iLikeIT2 aims at developing a tool and a methodology that is universal. Thus, we make cases that might fit in every level of the educational system, and the cases indicate where it is most suitable; High school, VET, Adult, HE.
Group size	Even if it is not necessary to keep the numbers accurate, some cases will work better in small groups instead of big, thus the case includes a recommendation for group members.

Prior knowledge	Some tools have more advanced functionalities than others, and some tools require more prior knowledge than other. The cases are based on the level of skills described in the DigiComp. Seeing that we are not testing digital skills themselves, the consortium decided to divide the competencies in three instead of six, and include all categories in the descriptions basic – intermediate – proficient. a. Instructor: Basic-intermediate-proficient, based on what is difficult or needed b. Participants: Basic-intermediate-proficient, based on what is difficult or needed
Functionality	It is not important what kind of tool is being used, the important thing is the functionality the tool provides. The casese therefore indicate which kind of functionality is needed to reach the learning objective of the session, for example chat, shared whiteboard, voting, content development, external communication, doc sharing, role allocation, feedback.
Subject	The category might be generic, but some cases are more specifically directed towards one subject, or one subject area.
Delivery mood	The cases indicate a delivery mood, online, f2f or hybrid, that is most suitable for that specific case. Still it is always possible to adapt to other delivery moods.

2) The case is described in a table, including the following elements. To each element there should be provided a reasoning behind the choices. Technology is nothing without pedagogy, which means that there need to be a strategy behind what is being done:

Type of tool	Not a specific tool, even if the case includes a possible suggestion. It is still functionality that matters.
Learning objective	Connected to curricular elements OR collaborative training
Collaborative element	What type of collaboration should the students learn from this
Aim of task	What is the end goal for the involved students
Activity:	What are the students supposed to do? Short description.
Instructions	Which instructions are provided to the students in order to achieve the learning objective and aim of task?
Post activity	Mainly to indicate type of assessment (formative/summative). Still the instructor is the main character in the environment, and needs to correct the participants in some way.

4.3. The cases

We have identified ten best cases, differentiated on different levels of the educational system. All cases can be consulted through the weblink in the Appendices. In this report we want to show one case from the Higher Education (HE), one from Vocational Education and Training (VET) and one from High School, to indicate what is possible to do with a digital tool:

4.3.1.   Higher Education (HE)

Level: **Higher education**

Group size: **A maximum of 8 students will be able to join the open-video discussions**

Prior knowledge: **Basic**
   a) **Instructor: Some IT knowledge to start the discussion and enable students to join it will be enough)**
   b) **Participants: Basic IT knowledge on how to join a meeting with a link or from the platform itself will be ok**

Functionality: **Shared whiteboard, content development, doc sharing**

Subject: **Politics/Critical thinking/Science**

Delivery mood: **Online environment**

	How	Why
Type of tool	The platform includes a tool that fosters open video discussions. Needs to have opportunities of turning on/off camera. Turn-taking, for example via raising hand. Example: Zoom	It is a good idea to get all students involved and engaged on the topic chosen by the teacher without requiring physical presence
Learning objective	To allow students to speak and transmit their opinions in a comfortable manner	Talking through a device at home is sometimes easier than talking in class where the rest of the class-mates are looking at you
Collaborative element	Active argumentation and participation as well as common conclusions reached after having reflected on the ideas exposed	Participants will first comment on their ideas regarding the topic. They might learn new ideas from listening to those of their mates and reach a better outcome
Aim of task	Encourage students to share their opinions and participate in discussions preventing that they keep their ideas for themselves and educating students to respect each other's turns to talk (by putting their hand up on the platform)	Both in the personal and professional scopes, it is very important for students to learn how to speak-up and transmit what they feel/think
Activity	The teacher will start a discussion through the platform (link could be directly sent to their mails with the discussion topic and time) and students shall join it.	To encourage active participation, sharing of ideas, making students think.
Instructions	Teachers will create a topic and post a video, image, article etc and add a description in which they will ask what they require from students. A link is generated and shared with	It is a way of motivating students to participate

	students to enable them direct access to the content posted and join the discussion.	
Post activity	Formative assessment. All groups definitions to be presented in plenary and assessed/discussed by peers.	Difficult to summarize and grade. More useful to understand the arguments from peers. The only thing that will be positively punctuated is that participants join the meeting and participate in it

4.3.2. Vocational Education and Training (VET)

Level: **VET education**

Group size: **4**

Prior knowledge: **(Necessary for attending/using the tool)**
  a) **Instructor:**
  b) **Participants:**

Functionality: **Content development**

Subject: **All**

Delivery mood: **Hybrid**

	How	Why
Type of tool	A tool that allows for video recording, storing and easy editing. Example: AZ Screen recorder	Video-making is thought to be particularly effective if coupled with an experiential learning approach as it initiates, extends and invites the reflective process.
Learning objective	Learn-by-design objective	Learning through the process is very important in VET education as it helps to prepare learners for occupations where creativity is necessary, drives new ideas in business and industry and helps to close skill gaps
Collaborative element	Groups of students will draft an outline in which all of them will think what information to include in the video, how to do it in an attractive manner (to be catchy), how to film it, assessment and more that is needed for the subject at hand.	There are 4 participants per group and with the sharing of ideas, there are more options for the video to be more attractive and to learn from others' errors and mistakes and improve abilities by correcting these mistakes.
Aim of task	To learn by recording experiences related to the topic	Video making will help to capture, store and allow for editing and replays multiple times

Activity	Imagine we are in a VET course of hairdressing. Teachers/learners can film themselves carrying out the hairdressing act and then make a self-assessment of their task to post it on the platform to ask for feedback/comments.	This is a way to enhance participation, to learn from teachers' practice (as they will be able to see how they carry out their activities and acquire new techniques that they can later replicate. In case it is learners who film themselves, it can be a perfect idea to see what they are doing right and what they could get better at (it tends to be very effective to see ourselves perform a given activity)
Instructions	Film all of the group's participants carrying out different activities included in that particular VET-course	
Post activity	Self-assessment by groups and receiving comments from the rest	With self-evaluation we expect participants to pay more attention to their own actions and those in their group to reflect upon what they are doing and end up with proposals of how to improve which is how you really learn to do practical work correctly

4.3.3.   High School

Level: **High school**

Group size: **6-10**

Prior knowledge: **Basic**
   a) **Instructor: Basic log-on experience**
   b) **Participants: Basic log-on experience**

Functionality: **Shared whiteboard, feedback, collaboration & sharing options**

Subject: **Anyone involved in the educational & business sector**

Delivery mood: **Online**

	How	**Why**
Type of tool	A tool that allows for creation of story & mind maps, diagrams, flowcharts, journey maps, etc. to present an idea or the scale of a project. Needs possibility for sharing with the rest of the team to receive feedback. Example: Miro Dashboard	Users can demonstrate an idea or the next steps of a project visually or do brainstorming and give feedback. A digital tool will bring extra graphics, ability to move around easily and highlight different ideas.

Learning objective	Acquire collaborative skills	The users will be able to effectively learn how to give feedback online and work through charts or brainstorming in written form by for example post-it notes
Collaborative element	Collaboration & Sharing options	The users will find out how to create & share a dashboard online and of course to be able to collaborate with the rest of the team online through a dashboard
Aim of task	To share the charts/maps successfully and collaborate	Acquiring collaborative skills through the design and sharing of actual content
Activity	To join the charts/maps	The users should be able to find out how they interact in such cases (e.g., how to give feedbacks, how to add sticky notes, how to write their opinion, how to add branches in the charts, etc.)
Instructions	The facilitator should be clear and precise to what they present/ demonstrate and instructions.	The users should follow the instructions and the way of thinking and how they can assist their supervisors or colleagues during this presentation.
Post activity	Feedback & successful collaboration among the team	

Appendices

All appendices to be found at this [Google Drive folder](#) (open to read for all)

Appendix A – METHODOLOGY FOR RESEARCH

- Tools' assessment:
  https://drive.google.com/drive/folders/12rCdrKLRYz0QYniWkFkEQ5t8uQTKYg7V?usp=sharing

- Comparative table of tools:
  https://docs.google.com/spreadsheets/d/1Q26kxW8bXCrf9cvu_NUIJuJh1H5-J5zi/edit?usp=sharing&ouid=113924855969403291146&rtpof=true&sd=true

- Questionnaires' answers : https://drive.google.com/drive/folders/1XFcUFE-T0uUN7_P7ghxCsyh6MKa3bIu9?usp=sharing

- National reports from the pilot testings:
  https://drive.google.com/drive/folders/10fYteHS6Yn11XKOFmDsxC_2W6Q9GVVVx?usp=sharing

Appendix B – FINDINGS AND RECOMMENDATIONS

- Grids of the Reflectional Conversation conducted by each Consortium partner:
  https://drive.google.com/drive/folders/1tPVnx6QjyLGV12RZYudIhzTR8uXqt8X6?usp=sharing

Appendix C – BEST CASES-EXAMPLES

- Best cases:
  https://drive.google.com/drive/folders/1_1DAuYNo6e9quXgdUhYnWmHFf6l1Mwmn?usp=sharing