



D8.4

Public final activity report





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The colMOOC: Integrating Conversational Agents and Learning Analytics in MOOCs

D8.4- Public final activity report

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Executive Summary

The deliverable presents an overview of the “colMOOC” project with emphasis on the impact achieved by the project. The document is structured in 4 major sections:

- (i) The colMOOC Consortium,
 - A short presentation of all partners in the colMOOC consortium is provided emphasizing also the specific role of each partner in the project.
- (ii) The objectives of the colMOOC project,
 - The objectives of the project are presented along with explanations to help the reader deeper understand the context and perspective of objective-setting in the beginning of the project.
- (iii) Summary of the results of the project,
 - A succinct summary of project results is presented organized in 4 sections (one for each objective). In each section the relevant objective, the actions and results achieved are clearly stated.
- (iv) Impact achieved by the project
 - The impact achieved by the project is described and numerical data are reported.

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List of Acronyms

Acronym	Description
AB	Advisory Board
CA	Conversational Agent
CoP	Community of Practice
DC	Data Category
DLP	Deliverable Lead Partner
DMP	Data Management Plan
EB	Ethics Board
HEI	Higher Education Institution
IPG	Intellectual Property Management Group
LA	Learning Analytics
MOOC	Massive Open Online Courses
PC	Project Coordinator
QA	Quality Assurance
QC	Quality Control
QEG	Quality Evaluation Group
SADMPP	Self-Assessment and Data Management Plan
SAP	Self-Assessment Plan
SB	Project Supervisory Board
SM	Scientific Manager
TM	Technical Manager
ToC	Table of Contents
UG	User Group
UI	User Interface
WPL	Work Package Leader

1 Introduction

1.1 Purpose of this document

The objective of this deliverable is to present:

- (i) The colMOOC Consortium,
 - A short presentation of all partners in the colMOOC consortium is provided also emphasizing the specific role of each partner in the project.
- (ii) The objectives of the colMOOC project,
 - The objectives of the project are presented along with explanations to help the reader deeper understand the context and perspective of objective-setting in the beginning of the project.
- (iii) Summary of the results of the Project,
 - A succinct summary of project results is presented organized in 4 sections (one for each objective). In each section the relevant objective, the actions and results achieved are clearly stated.
- (iv) Impact achieved by the Project
 - Both short term (achieved) and long term (expected) impact is presented and commented in two Tables.

1.2 Document structure

The current document is structured as follows:

- Section 1: this introductory section
- Section 2: Presentation of the Consortium
- Section 3: Objectives of the colMOOC Project
- Section 4: Summary of the results of the colMOOC project
- Section 5: Impact achieved by the colMOOC project
- Section 6: Conclusions

1.3 Audience

This deliverable is publicly available.

2 Presentation of the Consortium

2.1 Introduction

This section presents the colMOOC project consortium. It is structured as follows:

- Section 2.2 presents the synthesis of the Consortium and key information for each partner.
- Section 2.3 presents the rationale for building up the colMOOC partnership.
- Section 2.4 presents concisely the specific role of each partner within the project.

2.2 Synthesis of the Consortium

The following partners participate in the colMOOC consortium:

Table 1. Synthesis of the Consortium

No	Institution		Type	Country
1	AARHUS UNIVERSITY	AU	HEI	Denmark
2	Aristotle University of Thessaloniki	AUTH	HEI	Greece
3	Centre for Research and Technology-Hellas	CERTH	Research institution	Greece
4	Greek Universities Network	GUNET	Enterprise (Non-governmental organization)	Greece
5	Learnworlds Ltd	LW	Enterprise	Cyprus
6	Saarland University	SU	HEI	Germany
7	Telefónica Educación Digital	TED	Enterprise	Spain
8	Universidad de Valladolid (University of Valladolid)	UVA	HEI	Spain
9	Universitat Oberta de Catalunya (Open University of Catalonia)	UOC	HEI	Spain

2.3 Rationale for setting-up the partnership

The consortium consists of a mix of higher academic institutions and enterprises, all expert organizations in the fields of MOOCs, collaborative learning, conversational agents, learning analytics, educational software and policy reform.

The consortium was designed to broadly cover a wide geographical ground and consists of nine partners in five different countries (Cyprus, Denmark, Germany, Greece, Spain). More specifically, the partnership brings together:

- One higher education university (AUTH) with high expertise in Technology-enhanced learning and relevant needs analysis, conversational agents, learning analytics and educational activities.
- One higher education institution (SU) with a leading role in Collaborative learning.
- One higher education institution (AU) that is a pioneer in Peer learning.
- One higher education institution (UVA) with high expertise in learning design, education and Technology-enhanced learning.
- One higher education institution (UOC) with high expertise in distance learning and MOOCs.
- One non-governmental organization (GUNET) with a leading role in all levels of education in Greece with LMS platforms and specific MOOCs environments.
- One enterprise (LW) with high expertise in MOOCs environment and self-paced learning.
- One research institution (CERTH) that is a pioneer in leading edge technologies such as learning analytics, web monitoring and intelligent systems.
- One large enterprise (TED) that is pioneer in MOOCs in Spain and Latin America with more than 2m enrolled students.

2.4 Role of each partner in the project

The role, in broad terms and also in relation to the MOOC development, of each partner within the project has been as follows:

Table 2. Role of each partner in the project

No	Partner	Role in the Consortium
1	AU	Academic partner. Developing and running the “English MOOC”.
2	AUTH	Academic partner. Developing and running the “Greek MOOC”.
3	CERTH	Technical partner. Developing and supporting the implementation of the CA and LA software components.
4	GUNET	Technical partner. Integrating the CA and LA components in GUNET online course platform.
5	LW	Technical partner. Integrating the CA and LA components in Learnworlds online course platform.
6	SU	Academic partner. Developing and running the “German MOOC”.
7	TED	Technical partner. Integrating the CA and LA components in TED online course platform.
8	UVA	Academic partner. Developing and running the “Spanish MOOC”. Also setting up the Virtual Community of Practice platform.
9	UOC	Academic partner. Developing and running the “Spanish MOOC”

3 Objectives of colMOOC project

3.1 Introduction

This section presents the objectives of the project. It is structured as follows:

- Section 3.2 presents the project objectives (as presented in the project proposal) along with comments that help better understand the context and the perspective of colMOOC consortium while setting the objectives.

3.2 Project objectives

The objectives of the project have been described as follows:

- **O1.** Develop **new learning and teaching methods** for MOOCs building on novel technologies in collaborative learning like conversational agents for MOOCs that are capable of analysing **learner interaction**, facilitate learners' **self-regulation** and **self-assessment**, and that can be integrated in a MOOC platform.
 - *Comments:* Objective O1 dictates the development of “new learning and teaching methods”. This refers to the development of innovative conversational agents (CA) and learning analytics (LA) software components to be integrated in MOOC platforms and capable of being embedded in any of the participating MOOC platforms. The objective also refers to “analyzing learner interaction” which refers a) to the capability of the CA component to analyze students dialogue (interaction) when discussing in the MOOC agent-supported chat rooms, and b) the capability of the LA component to collect, process and graphically present to users (students and instructors) data about their participation and interaction in agent-supported chat rooms. Finally, “self-regulation and self-assessment” refers to the support that the LA component is expected to provide to students for self-regulating and self-assessing their participation in learning activities and also to teachers to provide feedback to students and help them in self-regulation and self-assessment efforts.
- **O2.** To **promote innovative solutions** to current and future challenges and for sustainable impact on Europe’s education and training systems. Towards this objective, **open access** will be granted to the conversational agents built within the project.
 - *Comments:* According to objective O2 “open access” should be a key objective of the project development activity. Also relevant here is the effort to develop the CA/LA software modules in a way that integration with different MOOC platforms can be facilitated, without being (the modules) hardwired only in one specific technological platform.
- **O3.** To **demonstrate and validate the built capacity** for innovative teaching and learning methods and mainstreaming them to the existing education and training systems. Towards this objective, we design, execute and assess **three pilots** on “Programming for Non-Programmers”, “Computational and Design Thinking”, and “Educational Technology for the Classroom” for university students as well as employed and unemployed adults that orchestrate individual and collaborative learning activities.
 - *Comments:* Objective O3 dictates that at least three pilot MOOCs should be developed and made available for University students as well as other interested adults, to a) demonstrate the technical feasibility of developing the technological tools (CA/LA components) as ‘open access’ components, and b) collect, process and

disseminate data about the educational impact that these tools may have on the target population.

- **O4. Spread the best practice** pilots built in the project to all participating universities and other economic and societal stakeholders (educational authorities and civil society organizations for further training for the unemployed, businesses for further training of the workforce) as well as granting access to the MOOCs on European and national providers for free, openly accessible MOOCs, e.g., platform.europeanmoocs.eu.
 - *Comments:* Objective O4 dictates that ‘best practice’ conclusions and lessons learnt from the colMOOC project (and relevant policy recommendations, of course) should be disseminated and shared with all economic and societal stakeholders and interested individuals and institutions.

4 Summary of the results of the colMOOC project

4.1 Introduction

In this section the results achieved by the project are presented organized in four subsections, each subsection focusing on each specific objective:

- Section 4.2: Results relevant to objective O.1
- Section 4.3: Results relevant to objective O.2
- Section 4.4: Results relevant to objective O.3
- Section 4.5: Results relevant to objective O.4
- Section 4.6: Conclusions

4.2 Results relevant to Objective 1

4.2.1 Actions to achieve Objective 1

Objective 1 (as described in project proposal): Develop new learning and teaching methods for MOOCs building on novel technologies in collaborative learning like conversational agents for MOOCs that are capable of analysing learner interaction, facilitate learners’ self-regulation and assessment, and that can be integrated in a MOOC platform.

To achieve objective 1 the colMOOC project enacted the following actions:

- *Design/development of conversational agent (CA) software component and exploring relevant learning/teaching methods in MOOC-based settings:*
 - The colMOOC consortium designed and developed the CA component providing innovative opportunities both for MOOC instructors (to embed the agent in MOOC chat activities) and for MOOC students (to interact in an “agent-chat activity”). By “agent-chat activity” we refer to a text-based chat MOOC activity, where students interact (in dyads) while the CA intervenes by prompting students, based on students’ dialogue analysis and the way the agent interventions were configured by the MOOC instructor. The instructor can configure the agent so that prompts are presented to peers either as domain-relevant questions or as task-relevant tips. The colMOOC agent can thus provide cognitive support in the learning process (by making conceptual questions or comments addressed to the dyad in general or to the student

who just made a comment), but also foster social interaction by prompting one student to add on or elaborate on the contributions made by other students.

- *Design/development of learning analytics (LA) software component and exploring relevant learning/teaching methods in MOOC-based settings:*
 - The colMOOC consortium also designed and developed an agent-relevant LA component providing data visualizations referring to students' interactions in the agent-chat activities. These analytics are expected to: a) guide the students themselves to self-regulate and self-assess their peer interaction in agent-chat activities, and b) facilitate instructors to perform supportive interventions helping students understand how to benefit themselves from peer interactions while participating in agent-chat activities.

4.2.2 Results

The results relevant to objective 1 delivered by the project are:

- **R1.1:** CA/LA components and related pedagogical methods for innovative learning and teaching have been developed and their impact has been explored. These components (and relevant methods) have been used and implemented in the various MOOC-based trials administered by the consortium to explore their learning/teaching impact and capacity in all these MOOC-based settings. Detailed presentation on all the above can be found at:
 - CA component analysis, design, and development: Deliverables D2.1 and D2.2
 - LA component analysis, design, and development: Deliverable D3.1
 - CA/LA technical implementation: Deliverables D4.x series (D4.1 through D4.7)
 - CA/LA embedment in MOOCs and data collected by offering MOOCs where learners had learning experiences mediated by the CA/LA components: Deliverables D5.2 and D5.3

4.3 Results relevant to Objective 2

4.3.1 Actions to achieve Objective 2

Objective 2 (as described in project proposal): To promote innovative solutions to current and future challenges and for sustainable impact on Europe's education and training systems. Towards this objective, open access will be granted to the conversational agents built within the project.

To achieve objective 2 the colMOOC project enacted the following actions:

- *Development of 'colMOOC platform' as open tool for integration with any MOOC platform:*
 - The colMOOC project designed and developed the CA/LA components (the 'colMOOC platform') as open web service able to be linked and embedded in various MOOC platforms (and not simply hardwired to the specific MOOC platforms of the partners in the project). The colMOOC platform connectivity has been implemented, tested, and verified for the three MOOC platforms participating in the project (GUNET, TED and LearnWorlds). However, this CA/LA service has been technically developed in a way that facilitates connectivity to any MOOC platform (as described in the technical implementation deliverables). Please note that this does not mean 'plug and play' type of connectivity, as certain technical modifications need to be implemented also on the side of the MOOC platform to be connected to the colMOOC CA/LA component.

4.3.2 Results

The results relevant to objective 2 delivered by the project are:

- **R2.1:** The colMOOC platform can be flexibly embedded to different MOOC platform as an additional learning tool/service. Detailed presentation of the technical aspects of the colMOOC platform and how it can be linked to a MOOC platform can be found at:
 - CA/LA technical implementation: Deliverables D4.x series (D4.1 through D4.7)

4.4 Results relevant to Objective 3

4.4.1 Actions to achieve Objective 3

Objective 3 (as described in project proposal): To demonstrate and validate the built capacity for innovative teaching and learning methods and mainstreaming them to the existing education and training systems. Towards this objective, we design, execute and assess three pilots on “Programming for Non-Programmers”, “Computational Thinking”, and “Educational Technology for the Classroom” for university students as well as employed and unemployed adults that orchestrate individual and collaborative learning activities.

To achieve objective 3 the colMOOC project enacted the following actions:

- *Design and development of four (4) pilot MOOCs:*
 - The colMOOC project designed and developed *four pilot MOOCs* (one more than what was described in the proposal), to demonstrate both the technical feasibility of the colMOOC platform connecting to various MOOC platforms and also the pedagogical efficiency of the developed CA/LA components. These MOOCs are:
 - “Computational thinking” (in English): designed and developed by the Aarhus University, Denmark. Technical support and platform: CERTH, Greece and GUNET, Greece.
 - “Educational technology for the classroom” (in German): designed and developed by the University of Saarland, Germany. Technical support and platform: CERTH, Greece and LearnWorlds, Cyprus.
 - “Educational technologies to support collaboration and assessment in virtual learning environment” (in Spanish): designed and developed in collaboration by the University of Valladolid, Spain and Open University of Catalunya, Spain. Technical support and platform: CERTH, Greece and TED (Telefónica Educación Digital), Spain.
 - “Programming for Non-Programmers” (in Greek): designed and developed by the Aristotle University of Thessaloniki, Greece. Technical support and platform: CERTH, Greece and GUNET, Greece.

4.4.2 Results

The results relevant to objective 3 delivered by the project are:

- **R3.1:** Overall the colMOOC Consortium conducted during the project lifetime: *12 trials* (research activities) utilizing *10 MOOC “editions”* (MOOC runs in various periods) of the above mentioned four pilot MOOCs. Worth mentioning is that in the accepted project proposal the number of trials mentioned was *five (5)*. The colMOOC project significantly exceeded this “promised” number, responding also to various requests and the interest generated to prospective learners. Following is the relevant Table 3 presenting these data in a structured manner.

Table 3. MOOCs editions offered by the colMOOC project

MOOC Title (Language)	Academic partner(s) running the MOOC Technical partner(s) supporting the MOOC	Duration (weeks)	MOOC Editions offered	Trials	Enrolled participants (learners)
Computational Thinking (English)	Aarhus University (AU), Denmark CERTH Greece and GUNET, Greece	4	1	1	102
Educational technology for the classroom (German)	Saarland University (USAAR), Germany CERTH Greece and LearnWorlds, Cyprus	5	2	4	98
Educational technologies in support for collaboration and evaluation in virtual learning environments (Spanish)	Universitat Oberta de Catalunya (UOC), Spain & Universidad de Valladolid (UVa), Spain CERTH Greece and Telefonica Education Digital, Spain	5	2	2	3070
Programming for non-Programmers (Greek)	Aristotle University of Thessaloniki (AUnTh), Greece CERTH Greece and GUNET, Greece	5	4 (as MOOC) 1 (as SPOC)	5	7349

Detailed presentation of design and implementation of all MOOC editions can be found at:

- Preparatory/design work carried out for the implementation of the MOOC editions: Deliverable D5.2
- Evaluation results from each MOOC edition: Deliverable D5.3

4.5 Results relevant to Objective 4

4.5.1 Actions to achieve Objective 4

Objective 4 (as described in project proposal): Spread the best practice pilots built in the project to all participating universities and other economic and societal stakeholders (educational authorities and civil society organizations for further training for the unemployed, businesses for further training of the workforce) as well as granting access to the MOOCs on European and national providers for free, openly accessible MOOCs.

To achieve objective 4 the colMOOC project enacted the following actions:

- *Development of colMOOC website:*
 - The colMOOC website has been developed as a means to disseminate the objectives, activities, MOOC editions and output of the project.
- *Development of colMOOC Virtual Community of Practice (VCoP):*
 - The colMOOC VCoP has been developed as a means to spread the conceptual approach and pedagogical/technical implementation of CA/LA design, facilitate the familiarization of community members with practical aspects of the CA/LA use (through demos), disseminate best practices regarding the use of CA/LA components in online learning activities and also initiate discussions and deliberations regarding the future use of conversational agents (and artificial intelligence in general) and learning analytics in digital learning.
- *Publicize project results:*
 - The colMOOC project has disseminated the objectives and activities of the project in relevant info-days and published a number of scientific announcements in various contexts (international conferences, edited volumes, workshops).
 - Based on gained experience the colMOOC consortium has published a ‘policy recommendation’ list, presenting recommendations to the various stakeholders involved in the adoption of Conversational Agents as a means of setting up productive learning discussions in online educational settings.
- *Develop a post-project exploitation and sustainability plan:*
 - The colMOOC partners have agreed on a specific exploitation and sustainability plan to follow after the project ends.

4.5.2 Results

The results relevant to objective 4 delivered by the project are:

- **R4.1:** The project website is operational and accessible at: <https://colmooc.eu/>. Detailed information about the design and development of the website can be found at:
 - Dissemination and Use Plan: Deliverable D7.1
- **R4.2:** The project Virtual Community of Practice is operational and accessible at: <https://colmooc.gsic.uva.es/index.php/en>. Detailed information about the design and development of the website can be found at:
 - Platform’s configuration: Deliverable D6.2
- **R4.3:** Detailed presentation of the policy recommendation list is available in:
 - Policy recommendations: Deliverable D6.3
- **R4.4:** Details about the scientific publications of the project and dissemination actions can be found at:
 - Exploitation and sustainability plan: Deliverable: D7.3
 - Full list of scientific publications (international conferences, chapters in edited volumes) at:
 - <https://colmooc.eu/results/>
 - Links to info days and project workshop pages available at:
 - <https://colmooc.eu/news/>
- **R4.5:** Details about the project exploitation and sustainability plan are available at:
 - Final exploitation and sustainability plan: Deliverable D7.5

5 Impact achieved by the colMOOC project

5.1 Introduction

This section demonstrates the impact achieved by the project providing also numerical data.

5.2 Project impact

In the following Table we report the impact achieved by the project during the project lifetime. The four columns of the Table are as follows:

- *Short term results*: A concise description of the results the project aimed for. We use “short term” to refer to the project lifetime, since the same terminology was also used in the project proposal.
- *Target groups/potential beneficiaries*: Description list of potential beneficiaries.
- *Quantitative indicators*: Numerical indicator of “short term” results as indicated in the project proposal.
- *Impact achieved by the project*: Impact actually achieved by the project (both numerical indicator and description)

Table 4. Impact achieved by the colMOOC project

Short term result (Project lifetime)	Target groups/potential beneficiaries (as in project proposal)	Quantitative indicators (as in project proposal)	Impact actually achieved by the project (Numerical and description)
<i>Innovative pedagogical approach</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	1	1 The project focused, designed and implemented one major innovative pedagogical approach based on the CA/LA tools. This approach has been demonstrated in 12 MOOC-based trials. In each and every of the above MOOCs editions the project demonstrated and collected data relevant to: a) The feasibility of technically developing the specific CA/LA platform, capable of being linked to any independent MOOCs platform. b) The pedagogical innovation of using the CA software component.

			In two MOOCs editions, the pedagogical innovation of also using the LA component was implemented and data were collected.
<i>Conversational agent module</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	1	1 The project developed the Conversational Agent module as a web service able to be linked and utilized in different MOOC platforms.
<i>Learning analytics (LA) module</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	1	1 The project developed the Learning analytics module as an open web service able to be linked and utilized in different MOOC platforms.
<i>E-learning space</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	3	3 Three e-learning spaces have been developed and tested in the various MOOC editions. The term “e-learning space” refers to the innovative linking between a typical MOOC platform and the newly developed colMOOC platform offering the CA and LA services. Thus, the e-learning spaces are: <ul style="list-style-type: none"> - GUNET platform + colMOOC platform - TED platform + colMOOC platform

			- LearnWorlds platform + colMOOC platform
<i>Policy recommendations</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	> 20	26 A list of policy recommendations has been developed as a result of implementing the various MOOC editions. These recommendations refer both to the technology and the pedagogy of using the CA/LA components in MOOCs.
<i>Learning resources</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	> 300	348 A great number of learning resources have been developed for the MOOCs during the project lifetime. By “learning resources” we refer to: <ul style="list-style-type: none"> - Videos developed for MOOCs - Questionnaire in the form of Quizzes for trainees - Digital presentations files - Projects for trainees - Chat-agent design - Learning analytics resources The above resources are accessible through the relevant MOOCs where they are embedded.
<i>Total sum of Learners participating in all trials</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	<i>(this item was not included in the original table in project proposal)</i>	- Registered: 10619 - Started: 6515 - Finished: 3416 This number refers to the <i>total number</i> of learners participating in the 12 MOOC trials (including both University students and all learners declaring their status as “employees”).

<i>University students participating in trials</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	> 400	- Started: 3085 This number includes both undergraduate and postgraduate University students participating in the various MOOCs editions. The number has been calculated including only those learners who have the profile of a University student (under- or post-graduate).
<i>Employees participating in trials</i>	University students, Private stakeholders (e.g. executives, employees), Public stakeholders (e.g. executives, employees), University teachers, Researchers, Trainers	> 50	- Started: 3430 This number includes all kinds of professionals (both employees and self-employed) participating in the various MOOCs editions.

5.3 Conclusions

Numerical data recorded demonstrate that the colMOOC project significantly surpassed several of the numerical objectives as initially set in the project proposal. Overall the project:

- Developed 4 different MOOCs each in one of 4 different languages (in project proposal: 3 MOOCs).
- Offered 12 different editions (trials) of these 4 MOOCs (in project proposal: 5 trials).
- Reached more than 10,000 interested learners all over the world (10,569 registered).
- Actually engaged more than 6,000 learners (6,465 started the courses from those initially registered).
- Achieved a significant retention/completion rate of MOOC learners (27% and 37% are percentage numbers reported for the Spanish and Greek MOOC respectively), significantly higher than retention/completion rates reported in many MOOCs in the literature. For example, Feng, Tang and Liu (2019) report completion rate in MOOCs below 5%.
- Overall developed 348 learning resources (in project proposal: >300)
- Provided a list with 26 policy recommendations (in project proposal: > 20)
- Engaged 3035 university students participating in editions/trials (in project proposal: > 400)
- Engaged 3430 employees participating in editions/trials (in project proposal: > 50)
- Made more than 10 publications in international peer reviewed scientific journals and conferences (in project proposal: “A minimum of 10 scientific papers...”).

- A detailed list of publications is available in Final Dissemination Activities Report: Deliverable 7.3
- Collected both qualitative and quantitative data regarding the learning impact and teaching implications when using the CA/LA components to enhance peer interaction in online learning environments.
 - A detailed report of data and relevant conclusions is available in Trials evaluation report: Deliverable 5.3.
- Developed a currently active Virtual Community of Practice numbering currently (as of June 2021) 140 active members.

References

- Caballé, S. et al. (2021a). D5.2: Trials report. Deliverable 5.2 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Caballé, S. et al. (2021b). D5.3: Trials evaluation report. Deliverable 5.3 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Demetriadis, S., Tegos, S. & Psathas, G. (2018a). D2.1: Conversational Agent Model Design. Deliverable 2.1 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Demetriadis, S., Tegos, S. & Psathas, G. (2018b). D2.2 Conversational Agent Module. Deliverable 2.2 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Feng, W., Tang, J., & Liu, T. X. (2019). Understanding dropouts in MOOCs. PBC School of Finance of Tsinghua University and Association for the Advancement of Artificial Intelligence. Retrieved January 10, 2020, from <http://keg.cs.tsinghua.edu.cn/jietang/publications/AAAI19-Feng-dropout-moocs.pdf>.
- Gómez-Sánchez, E., Asensio-Pérez, J.I., Michos, K., & Ortega-Arranz, A. (2021a). D6.2: Community building platform final version. Deliverable 6.2 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Gómez-Sánchez, E., Asensio-Pérez, J.I., Michos, K., & Ortega-Arranz, A. (2021b). D6.3: Policy recommendations. Deliverable 6.3 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E. & Demetriadis, S. (2018a). D4.1: Technological roadmap. Deliverable 4.1 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E. & Demetriadis, S. (2018b). D4.2: Integrated colMOOC platform 1st version and applications. Deliverable 4.2 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E. & Demetriadis, S. (2019a). D4.3: 1st evaluation report. Deliverable 4.3 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E. & Prountzos, G. (2019b). D4.4: Integrated colMOOC platform 2nd version. Deliverable 4.4 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E. & Prountzos, G. (2020). D4.5: 2nd evaluation report. Deliverable 4.5 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E., Prountzos, G., Apostolou, K. & Tzionis, G. (2020). D4.6: Final colMOOC system. Deliverable 4.6 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Nikolaidis, E., Prountzos, G., Apostolou, K. & Tzionis, G. (2021). D4.7: Final evaluation report. Deliverable 4.7 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.
- Oproiou Dumitru, D.E., & Inzolia, Y. (2018). D7.1: Dissemination and Use Plan. Deliverable 7.1 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.

Tsiatsos, T., Tegos, S. & Nikolaidis, E. (2019). D3.1: LA modules analysis and configuration. Deliverable 3.1 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.

Weinberger, A. et al. (2018). D1.1: MOOCs analysis. Deliverable 1.1 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.

Weinberger, A. et al. (2018). D1.2: CA and LA analysis. Deliverable 1.2 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.

Weinberger, A. et al. (2018). D1.3: Educational approach and framework. Deliverable 1.3 of the colMOOC project funded under the Erasmus+ Knowledge Alliances programme of the European Union, GA No: 2017-2841/001-001.

Annex I: Addressing the interim reviewers comments/suggestions

In this Annex (Table 5 below) we provide details of how the consortium also considered the interim reviewers comments and suggestions during the second half of the project lifetime. In the “Reviewers’ Comment” column the numbered section title in parentheses refers to the respective section in reviewers’ interim report.

Table 5. Addressing interim reviewers’ comments/suggestions

Reviewers’ Comment	Consortium Comment
- (2.3 Quality assurance): ... External reviewers and experts are mentioned as part of the strategy but the materials submitted do not contain any documentary evidence of their having given opinions.	Indeed the project did not engage external reviewers/experts although we mentioned that possibility (D8.1, pg 36, Advisory board). But it was mentioned as a possibility "non-binding for the project".
- (3.1 Partnership, cooperation and participation): ...However, there is a clear dominance of P1 and P2 ... especially with regard to P2... The unequal status of the various partners has not been explained nor is any evaluative description given of the degree of enthusiasm and commitment of the different partners to the project as a result of the relatively marginal or reactive role assigned to some of them...	In the consortium it was clear from the beginning (as described in the workplan) what was expected from each partner. All partners accepted their role and contributed accordingly. So, we decline the "dominance and unequal status" comment.
- (3.1 Partnership, cooperation and participation):...The benefits for the business are described in rather generic terms..	Business partners (also the associated partners) have been asked to contribute a short report explaining the benefits for their business that emerged from project participation. These reports can be found in the next Annex II.
- (3.1.2 Contribution of Associated Partners): ...benefit from the project are not specified.	(similar as above in third item/row)
- (3.2 Management): The report provides a factual description of the coordination of the project without any evaluation of the degree of success achieved... There is no mention of management having encountered difficulties or of how these were addressed and solved..	In the project Final report (section 2.2 Implementation of the work plan / tasks) there is detailed description about management issues during the project lifetime and how they were solved (such as, amendments enactment and LA component development delay).

<p>- (4.1 Dissemination): ...very little evaluation of the effectiveness of these activities is given in the report... This also applies to the dissemination deliverables which give detailed information about strategies and target groups but do not investigate how successful the campaigns have been to date</p>	<p>In the consortium we believe the numbers that we provide regarding student/learners' registration in MOOCs, that significantly exceed what was initially promised in the workplan provides evidence for the success of dissemination activity.</p>
<p>- (4.1 Dissemination):...none of the deliverables already achieved are accessible via the website despite the statement in the report that all results are open to public.</p>	<p>All interim 'public' deliverables are openly available on the website. Similarly, public deliverables of the second half of the project lifetime will be (or are already) available through the project website.</p>
<p>- (4.2 Exploitation): ...A louder voice from the various business partners could have been useful here</p>	<p>See comment above about “business partners report” (third item/row of this Table). Also the exploitation plan is now available and business partners have contributed plans for future exploitation of MOOCs and CA/LA software.</p>
<p>- (4.3 Impact): ...this aspect of work has not been demonstrably given the attention it requires...</p>	<p>There is now a full section reported in the current deliverable 8.4 about the impact made by the project (section 5).</p>
<p>- (4.4 Sustainability): ...not made any statement about sustainability...</p>	<p>Sustainability issues are now dealt with and commented in deliverable 7.4.</p>

Annex II: “Business partners’ voice”

Business partners (also the associate partners) have been asked to contribute a short report explaining the benefits for their business that emerged from project participation. In the following we present these reports.

- **Business partner: TELEFONICA EDUCATION DIGITAL (TED)**

- 1) *What was your initial motivation to join this specific project? Did you believe that the project objectives were relevant and could add value to your business?*

UNESCO calculates that in 2025 the demand for Higher Education will increase by up to 80 million people. The only viable solution for catering to these needs is through digital education.

Telefónica Educación Digital, through its Miriadax platform, boosts educational innovation of the university institutions making the incorporation to the digital society possible through technological content solutions (MOOCs, simulators, Virtual Reality, etc.).

Through colMOOC and its conversational pedagogical agent we add a new service to our MOOC production offer, adding value in improving completion rates (increase the number of users finishing courses and, if it the case, paying for certification). we boost the use of collaborative tools and invigoration of communities.

Promote innovative pedagogical practices in educational digital platforms; practices with solid training results, beyond the university world, related to collaborative and cooperative work in network, where the training areas of the business world are betting significantly, is something that we consider of maximum relevance. Lifelong training begins in the academic world but will continue in very different settings where TED is involved: business world, other non-regulated continuing training, ...

- 2) *After the project end do you believe that the results indeed add value and benefit to your business? Please be constructive and provide some feedback from both perspectives (positive highlights and constructive criticism).*

The student is the center of learning and our tutors ensure that the process is satisfactory and finishes the training plan efficiently. They encourage cooperative learning; conduct personalized follow-ups; motivate through active listening and evaluate the process.

Through colMOOC, we can provide a tool as a teacher – student mediator and increase the engagement of the online students, guide and support student dialogue using natural language both in individual and collaborative settings.

We understand that all these new functionalities, properly incorporated into a well-structured instructional design of our partners' courses, should substantially increase the improvement in the results of the MOOC ecosystem.

So far, we have not been able to exploit the results of the project beyond the pilots. By introducing the CA and LA components in a selection of Miriadax courses, we hope to:

1. Increase the number of students completing more technical courses.
2. Improve the feedback and rating of these courses.
3. Increase the number of certificates being delivered/sold.

4. Increase the quality of training methodologies

The pilots experience shows there are positive and promising results about the impact of agent interventions, the feeling of community, the teachers' acceptance of the LA component, the student satisfaction. At the same time, there is a clear need for improvement of the used paring service to support students in transparently and efficiently finding or selecting a partner for the synchronous agent-chat activity which is of the utmost interest to improve, as the proposed methodological approach is working.

- 3) *Do you think you would like to further exploit the results of the project (both software or in other form)? What potential do you see in this exploitation relevant to your business? If no, what do you think is the objective for your business to exploit the project results? Do you have any suggestion for improving the project results if the opportunity is given in the future?*

One of our main objectives is positioning TED and participating Universities as leading players in innovation in MOOCs and tackling low completion rates.

The results of the project address B2C (MOOC users) / B2B – new partners and paying corporates who see added value in partnering with TED and Miriadax to achieve their objectives. TED is interested in increasing the rentability of the specialized MOOCs which have both the CA and LA components integrated. This model would also be of interest to participating universities who share in the revenue generated by the sale of the certificates.

And in a more global vision of the company, TED would be interested in incorporating the results of this project into its portfolio of products. Therefore, we believe that this project should have a broader scope, beyond training through universities and increase the professional skills of companies.

- 4) *Do you think that the project followed a balanced approach in addressing the needs and perspectives of both academic and business partners?*

The project followed a balanced approach in addressing the needs and perspectives of both academic and business partners, at least in relation to our core business. The benefit for our company of adding a substantial value in functionalities of potential great demand in the future, being able to test the solutions with suitable partners and in training environments of maximum value, it is only possible belonging to this type of consortiums. Financing is very important, but the prestige that our corporation acquires for belonging to these projects is of the utmost relevance in order to reduce entry barriers to experiment with these pioneering agents and enable innovation in our products to accelerate (and thus adequately position ourselves in a market as internationally competitive as MOOCs, where competition comes from outside Europe)

We believe that universities also partially meet their needs for improvement and progress by encouraging research in pioneering teaching-learning models, University-Company collaboration models, etc.

- 5) *What would you highlight as important benefits for your business from participating in the project?*

As we have indicated in previous sections, we consider that this type of project benefits entities like ours in the following aspects:

1. Improvement in the functionalities of the future demand for collaborative and networked MOOCs. The trend we observe in the demand among our clients indicates an increase in the demand for pedagogical and didactic practices of network collaboration, peer work, synchronous and asynchronous cooperative dynamics ... And this is due to the new forms of "distance" work that they are implanting in such companies. We believe, therefore, that the potential for new training products that incorporate this type of innovative functionalities is very broad.

2. Carrying out relevant practical research and guided experiences will only be possible with suitable partners. The consortium formula is, in our opinion, the most appropriate. It is due to the incorporation of prestigious partners, who are specialized in this type of techno-educational challenges and with a very solid network of possible third-party collaborators that make the correct implementation of the project feasible.

3. Finally, the financing. It is the problem that companies and universities will always have in order to experiment in digital educational innovation. It is difficult to obtain own resources to develop new products whose viability and market or social interest have yet to be verified. However, our non-European competitors do have the financial muscle to investigate these types of disruptive innovations.

6) *Any other relevant comments/ideas/suggestions?*

The coordination of the project has been fundamental to be able to join us to this type of university-company collaboration. Our sometimes-meager experience has been greatly facilitated by the availability and knowledge of the coordinator.

The good collaborative spirit of the different institutions we worked with during these three years added to the success of the project, they have been facilitators but also very good pedagogues.

• **Business partner: LEARNWORLDS**

LearnWorlds is an edtech SME on a path to transform self-paced learning. It wishes to become the best “educational amplifier”, empowering trainers, educators and content authors to create unique, enjoyable and social learning experiences. The innovative LearnWorlds platform is a cloud-based, white-label, e-learning management system that offers to training organizations and professional trainers, an easy, hassle-free way to create their own, personally branded, online schools and deliver/sell interactive, self-paced premium courses to their learners.

With LearnWorlds, trainers can i) design holistic learning experiences (using interactive video, ebook, integrated social networking, gamification, questionnaires, and a lot more), ii) better understand their users through analytics and marketing tools and iii) transform their teaching passion into learners’ enjoyment and increased sales. The company has advanced expertise in UI/UX design for educational applications and in the development of highly interactive, scalable web applications.

The aim of our involvement in colMOOC was to identify and understand the usage and the value of Conversational Agents to commercial elearning applications and enhance the capacity of our platform to adapt to varying user needs and usage scenarios through them. Conversational Agents seemed from the beginning as an intriguing path for enabling LearnWorlds school owners to create interactive, engaging, supportive and social learning experiences. colMOOC project designed, developed and tested an innovative Conversational Agent (CA) to support students’ social interaction and trigger domain-relevant cognitive activity. colMOOC managed to create an infrastructure that provides conversational agents which can be embedded as learning activities inside the LearnWorlds platform, hence we explored CAs as an external service. The experiment

that run with the LearnWorlds platform offered useful insights on a design direction which wasn't explored in the past from the company. Although the specific services are not going to be used as is in the commercial version of the LearnWorlds platform, they became an excellent source of discussions in the R&D department of the company regarding ways to exploit the pros of the study and the ideas that bring conversational agents in the table.

From a commercial point of view, the conclusions were:

- School owners can be supported successfully in order to create semi-autonomous agent-based environments that promote social interactions. Social interactivity in self-paced learning settings is of huge importance for delivering more vivid and authentic learning experiences and, consequently, for selling more courses. Based on the project experience, we estimate that similar learning activities will appear more frequently in the near future in the Learning Management Systems market.
- Conversational agents although are not easy to be authored, they can become an important advantage for online schools in which domain knowledge is well defined and in learning subjects which require more elaborated in-depth approaches. The sophisticated level of supporting the students is something unknown in the course selling market and can become a differentiator factor in a quite competitive and saturated landscape.
- It was also quite self-evident that conversational agents approach is not suitable for school owners who pursue more lightweight courses that are produced fast and without requirements for high learning results. CAs set high barriers for novice and inexperienced course designers.
- Since LearnWorlds customers are instructors, the authoring experience of CAs should be improved a lot before becoming commercial in our market. Course creators seek easy to use environments with reduced burden on developing courses. Probably, new tools should be considered for developing and testing the Knowledge Domain required.
- colMooC project also enabled us to identify ways to form and setup a context for synchronous interactions between students. The matching approaches and the whole organization of the CAs activity was considered as an interesting pilot for delivering similar collaboration schemes in the near future
-

LearnWorlds platform got a head start over other competitors in CAs technology, its pros and cons. Our R&D department is already designing new learning activities that have been initiated and influenced by the colMOOC project.

- **Associate Business partner: LETSTUDY**

Letstudy is an Online Learning Platform located in Greece, providing Massive Open Online Courses (MOOCs) to Greek students. As a MOOC provider, Letstudy aims to elaborate on practices that could improve students' experience and learning outcomes.

Integrating collaborative activities in MOOCs is expected to positively affect students' engagement at motivational and cognitive levels, increasing students' engagement and reducing dropouts. Having that in mind, we decided to get involved in the colMOOC project to investigate whether collaborative activities could enhance the learning experience and whether we could implement such activities in our courses. To that extend, we assisted students enrolled in the "Programming for non-Programmers" MOOC to audit their experience, track their performance and evaluate their interaction with the agent. Furthermore, through our involvement in the colMOOC project, we wanted to audit both the conversational agent and learning analytics

module technical details to evaluate the possible integration of the colMOOC to the Letstudy platform based on Open Edx.

Based on the results collected from various course trials, we concluded that the agent chat collaborative activities helped students enhance their learning outcomes, which is a positive factor in considering adding the colMOOC agent chat activities to our platform. Although we noticed some areas for further consideration, such as the pairing mechanism, we concluded that the positive outcomes of using such activities in our courses outweigh the areas that need further optimization.

Most MOOC platforms use only videos, quizzes, and extra reading materials to form their courses. Only a few platforms offer collaborative activities, although these kinds of activities enhance learning. Place our company in the market as MOOC providers that instructors could use both the typical learning material and collaborative activities, we believe that this will become a competitive advantage for our company. By exploiting the project results, we can support that agent chat activities provide better learning outcomes and other positive aspects. This exploitation would establish the advantages of the colMOOC agent usage in Online courses thus would benefit our platform incorporating such activities.

Participating in the colMOOC project helped us better understand all the technical aspects of the colMOOC project needed to incorporate the project into our platform. Also, through our involvement in the project, we would be able to receive immediate feedback from the students' and engaged in all the procedures related to the activities. In addition, we elaborated on how instructors could set up the activities and audit students' performance through the Learning Analytics module.

Based on our experience with the colMOOC project and having noticed all the positive aspects regarding the agent chat activities to students, we are looking for solutions to develop an x-block for the Open Edx platform to incorporate the colMOOC project into the Letstudy platform.

- **Associate Business partner: ENCHATTED**

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- Final Project Report by Enchatted

As a software development agency that has heavily invested in chatbot R&D, we were excited to join the colMOOC community because we were interested in finding out whether chatbots have a key role to play in the context of future MOOCs. We wanted to know whether these virtual agents can effectively support teaching & learning at such a massive scale.

Following our participating in the colMOOC project, we are confident to say that educational conversational agents are here to stay. They can serve as a useful pedagogical tool that, when designed right, appear to be able to amplify and automate effective teaching strategies. This finding is very important considering the impact of the Covid-19 pandemic, which has accelerated the adoption of distance learning environments and methods.

Upon joining the project, we were also interested in exploring how such ‘first-of-their-kind’ configurable bots, which require no programming skills to be re-used in different educational domains, could be utilized in real-world scenarios. Surprisingly, we found out that advanced AI and natural language processing (NLP) capabilities are not always required to be able to deliver a beneficial learning experience for large audiences. There is certainly room for improvement and fine-tuning, something that has already been discussed during the project lifecycle (e.g., resolving students’ scheduling issues); but we consider the project results to be highly valuable overall.

Through our contributions relating to UI designs and stemming techniques, we believe we were able to both contribute meaningfully to the project and benefit from building new skills and expanding our knowledge on educational chatbots. In general, we are happy that we had the opportunity to collaborate with such passionate academic and business teams, helping the project to achieve its objectives. We would be really interested to continue working on this field and see the colMOOC conversational agent service grow even further in the future.