BYOD-Learning

AT ANY TIME, AT ANY PLACE VIA ANY DEVICE

Result 1

EUROPEAN PLATFORM OF VIDEO LESSONS

HOSTING VIDEOS ACCESSIBLE BY TEACHERS, STUDENTS AT ANY TIME AND ANY PLACE AND THROUGH ANY DEVICE APPLYING AN APPROACH OF BYOD (BRING YOUR OWN DEVICE)

Co-funded by the European Union

BYOD-Learning

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BYOD-Learning: Learning at Any Time, at Any Place via any Device

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Contents

Executive Summary

The European Platform of Video Lessons is an innovative initiative aimed at redefining the landscape of mathematics education within secondary schools, with a specific emphasis on seventh-grade students. This initiative introduces a dynamic and versatile learning environment, embracing the innovative concept of Bring Your Own Device (BYOD) to ensure seamless access for educators and learners, anytime and anywhere, through any device. Central to this outcome, the collaborative partnership has successfully engineered a distinctive learning platform exclusively dedicated to hosting video lessons, aligning with predefined criteria meticulously considered during its inception.

The fundamental principle revolves around empowering students to actively shape their educational journey. During the piloting phase of the platform, teachers from the consortium developed videos in three speeds, tailored to suit three distinct achievement levels: 15-minute segments for high achievers, 30-minute segments for average students, and 45-minute segments for those needing additional support. This three-tiered approach is unprecedented and promises to promote both inclusivity and challenge within the learning process. During the pilot implementation, both educators and students engaged extensively with the platform, actively participating in a comprehensive exploration of its structure, functionality, and content. Valuable feedback garnered from this pilot phase contributed significantly to refining the platform, ensuring that it resonates effectively with the practical needs and expectations of all stakeholders involved. This document consists of four core chapters:

1. Design and programming of the interface
2. Development of the methodology and educational approach
3. Objectives of the learning videos
4. Testing of the BETA version

1. Design and programming of the interface

The development of the BYOD Virtual Learning Environment (VLE) has been carefully shaped to provide users comprehensive and essential information. This strategic approach ensures that the platform effectively serves its intended purpose by delivering relevant insights and guidance.

Moreover, the acknowledgement of EU co-funding serves as a testament to transparency and accountability. This recognition is underscored by the inclusion of the relevant logo and a disclaimer, signifying a commitment to ethical reporting and responsible usage of allocated resources.

The user experience remains at the forefront of the BYOD VLE's design philosophy. A user-friendly interface has been meticulously cultivated to ensure accessibility and ease of navigation, ultimately enhancing user engagement and promoting a seamless learning journey.

In addition to its user-centric design, the platform has been fortified with sophisticated monitoring and feedback mechanisms. These features enable users to access valuable analytics pertaining to their interactions and participation on the website. This data-driven approach empowers learners and educators alike to gauge progress, identify patterns, and optimize their engagement strategies for more effective learning outcomes.

1.1 BYOD Virtual Learning Environment (VLE) - Course Content License

The BYOD VLE hosts the BYOD VOOC. With the aim of this course, students in secondary education, especially 7 graders will develop skills, knowledge and competencies in mathematics. The course, including all material provided, will integrate the latest advancements in the field through video lessons covering the curriculum in support of two-fold solutions: (1) digital learning solution and (2) support to mix ability classes outside the classroom.

The training material will be widely available as **Open Educational Resources**. The Platform is accessible to teachers and students at any time and any place and through any device, by applying the BYOD methodology. Constraints imposed concern the commercial reuse of the material as well as giving appropriate credit and license when reusing the material. The resources are released under the **Creative Commons Attribution-NonCommercial 4.0 International Licence.**

All resources will be made available in downloadable and editable formats so that the user can store them locally and access them when offline (such as text documents, presentations and videos).

The BYOD VLE follows the latest technology in Online Training to allow for collaborative interaction between its users through both learning and assessment activities. The BYOD VLE is incorporated into the project website: www.byod-learning.eu

The BYOD VLE is based on the edX software, the Open edx[1]. This software platform is designed to engage the participants and teachers in an interactive and modular manner. It promotes active learning by using video snippets, interactive components, and game-like experiences.

1.2 Learning Management System (LMS)

The technological foundation of the platform is anchored in the utilization of Open edX, a robust and versatile Learning Management System (LMS) that underpins its seamless operation. Open edX has been thoughtfully chosen for its exceptional capabilities tailored to the modern landscape of online education, particularly within the context of Massive Open Online Courses (MOOCs) and self-paced learning environments.

One of the standout characteristics of Open edX is its innate ability to gracefully accommodate a diverse and expansive user base. Tailored to the demands of larger-scale audiences, the platform is adept at delivering a consistent and engaging learning experience to a wide array of learners, irrespective of their geographical location or time constraints. This scalability ensures that the platform remains robust and responsive even in the face of high user volumes.

A hallmark of Open edX is its comprehensive suite of interactive features that foster meaningful learner engagement. With interactive forums and discussion boards, learners can actively participate in collaborative discussions, share insights, and seek clarifications, thus cultivating a

[1] https://www.edx.org/ .

sense of community and enhancing the overall learning experience. This real-time interactivity empowers learners to delve deeper into course content and engage in meaningful exchanges with both instructors and peers.

In a digital landscape characterized by diverse devices and screen sizes, Open edX rises to the occasion by seamlessly adapting to various platforms. Whether accessed through a desktop computer, laptop, tablet, or smartphone, learners can effortlessly navigate the platform, access course materials, and engage in interactive activities, ensuring a consistent and user-friendly experience regardless of their chosen device.

Moreover, Open edX leverages advanced technology to deliver interactive content through adaptive video streaming. This dynamic approach to content delivery enhances engagement by tailoring video content to each learner's preferences and learning pace. By seamlessly adjusting video quality based on available bandwidth and device specifications, the platform ensures a smooth and uninterrupted viewing experience, even in resource-constrained environments.

Beyond its interactive features, Open edX is a treasure trove of data-driven insights. The LMS offers a suite of intelligent, learner-centric analytics that provide instructors with a comprehensive understanding of how learners interact with course material. These insights empower educators to make informed decisions about instructional design, identify areas for improvement, and adapt their teaching strategies to better cater to the needs and preferences of their learners.

1.3 Contextual Requirements of the VLE

The Platform leverages the inherent capabilities of the Open edX framework, capitalizing on its rich array of functionalities. This choice is rooted in the fact that Open edX stands as an open-source Learning Management System (LMS), affording the flexibility to tailor its features to align precisely with diverse requirements.

By harnessing the versatility of Open edX, the Platform gains access to a wide spectrum of tools and features that are finely attuned to modern online learning paradigms. This strategic utilization empowers administrators and educators alike to sculpt the learning environment according to their unique specifications, thereby fostering an enriched and personalized educational journey.

Open edX's open-source nature embodies a key advantage, allowing for extensive modifications and enhancements. This malleability ensures that the Platform can seamlessly evolve in tandem with the ever-changing landscape of education, incorporating novel features and functionalities as they emerge. The modular architecture of Open edX serves as an invaluable asset, facilitating the integration of custom modules, extensions, and plugins that enable the Platform to address a plethora of specialized needs.

This adaptability extends to both the technical and pedagogical realms. The underlying infrastructure of Open edX can be finely tuned to align with the specific technological infrastructure of an institution, ensuring a seamless integration with existing systems. Additionally, the

pedagogical methodologies and instructional approaches can be seamlessly integrated into the LMS, enabling educators to curate engaging and effective learning experiences that cater to the unique needs and preferences of their learners.

1.4 Modularity

In contrast to lengthy hour-long lectures, the curriculum structure embraces a modular approach, comprising a multitude of easily digestible components. These encompass concise video segments, each spanning durations of 15, 30, or 45 minutes, along with standalone exercises designed to reinforce comprehension and application.

The instructional modules are meticulously structured to foster an optimal learning rhythm. Within this framework, instructional resources such as video modules, reading materials, and PowerPoint presentations seamlessly intertwine with purposeful exercises, cultivating a dynamic and engaging learning journey.

This pedagogical design, characterized by its emphasis on bite-sized learning and balanced integration of various elements, aims to enhance the effectiveness and retention of knowledge while accommodating diverse learning preferences and styles. By interweaving informative content delivery with active learning through exercises, learners are poised to experience a harmonious blend of conceptual understanding and practical application, ultimately fostering a deeper understanding of the subject matter.

1.5 Learning sequence

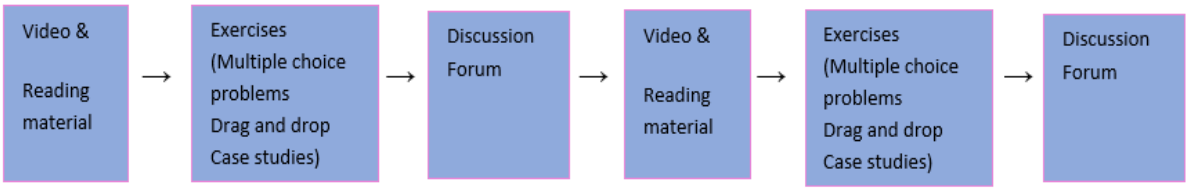
A typical educational sequence involves a structured sequence commencing with a video lecture supplemented by relevant reading materials. This initial exposure to conceptual content is followed by a prompt engagement in a brief yet impactful exercise. Subsequently, the learning journey continues to unfold with another immersive video lecture accompanied by relevant reading materials, seamlessly followed by a subsequent exercise. This approach ensures a dynamic interplay between instructional delivery and active reinforcement, thereby optimizing the process of knowledge assimilation.

Within this meticulously devised learning framework, each facet serves a distinct and valuable purpose. The video lectures deliver comprehensive insights, enriched by visual and auditory stimuli, that cater to diverse learning modalities. Complementary reading materials afford learners the opportunity to delve deeper into the subject matter, reinforcing their understanding through text.

The integration of exercises at strategic intervals capitalizes on the principles of active learning, encouraging learners to apply acquired knowledge in a practical context. These exercises serve as meaningful checkpoints, consolidating comprehension and facilitating the immediate application

of concepts. By alternating between videos, reading, and exercises, the learning sequence sustains engagement while promoting a comprehensive and enduring grasp of the subject matter.

In essence, this meticulous sequence encapsulates a harmonious fusion of didactic delivery and experiential engagement. By structuring the educational journey to encompass informative video lessons, enriched reading materials, and targeted exercises, learners are empowered to navigate the learning process with enhanced efficacy, fostering a more profound and enduring understanding of the material at hand.



1.6 Course architecture

The foundational structure of the Course is meticulously designed around a comprehensive framework comprising distinct building blocks, each serving a pivotal role in shaping an effective and cohesive learning experience:

1. **Course Outline:** The foundation of the Course's architecture resides in the course outline—a dynamic container that holds the entirety of the course's educational content. This outline provides a conceptual framework within which the entire learning journey is organized and presented. It serves as a strategic roadmap, guiding learners through the course's intricacies and facilitating a clear understanding of the overall structure. The course outline encompasses various sections, ensuring a logical and systematic progression of topics and concepts.
2. **Course sections (Modules/Weeks):** Positioned at the top of the course hierarchy, they serve as fundamental divisions that often correspond to designated time periods within the curriculum. Each section represents a cohesive collection of thematic content. These sections offer an intuitive navigational framework, facilitating learners' engagement and interaction with the material. Within each section, the architecture accommodates the inclusion of one or more subsections, which further refine the organization and presentation of content.

    - **Course Subsections (Lessons):** As integral components of the course sections, course subsections play a pivotal role in shaping the learning narrative. A subsection typically encapsulates a distinct topic or organizing principle, serving as a coherent

unit of exploration for learners. Often referred to as "lessons" or "learning sequences," these subsections streamline the presentation of content, enabling learners to delve into specific subject matter with precision and clarity. Each subsection contains a wealth of informative material that contributes to the holistic understanding of the topic at hand.

- **Course Units:** Within the realm of course subsections, course units function as discrete modules of instruction. Presented as individual pages, these units serve as focal points for learners' engagement, spotlighting key concepts and enabling focused exploration. A course unit encapsulates a condensed yet impactful exploration of a specific facet of the subject matter, fostering a deeper understanding through concise and focused content delivery.

- **Course Components:** At the heart of each course unit, course components emerge as the channels through which learners engage with the course content. Diverse and multifaceted, these components encompass an array of instructional elements designed to enhance the learning experience. Learners encounter a rich variety of components, including learning videos, reading material, problems/quizzes and discussion forums.

BYOD course building blocks	Title	Description	
Section/Module 1		Is the top level of the course and typically represent a time period (week)	
Subsection/Lesson 1		it represents a topic or other organizing principle and is also called "lesson"	
Unit 1		A unit contains one or more components, which represent the actual course content.: **Videos, problems/quizzes, reading material, discussion forums.**	
Unit 2		A unit contains one or more components, which represent the actual course content.: Videos, problems/quizzes, reading material, discussion forums.	
Unit ..		A unit contains one or more components, which represent the actual course content.: Videos, problems/quizzes, reading material, discussion forums.	
Subsection/Lesson 2			
Unit 1			
Unit 2			
Unit ..			
Subsection/Lesson ..			
Unit 1			
Unit 2			
Unit ..			
Section/Module 2			
Subsection/Lesson 1			

1.7 Problem types and feedback questions

The learning platform features a diverse range of interactive assessment formats, carefully curated to enhance learner engagement and comprehension. These encompass:

1. **Multiple Choice/Checkbox/Dropdown Problems:** This collection of assessment types offers a versatile approach to evaluating learners' grasp of the material. Learners are presented with a spectrum of choices, including multiple choice, checkboxes, and dropdown selections. These exercises efficiently gauge learners' understanding of key concepts while providing immediate feedback that aids in reinforcing correct responses and rectifying misconceptions.

2. **Image Mapped Input/Drag and Drop Problems:** These innovative assessment formats leverage visual elements to challenge learners' analytical and spatial cognition. Through image mapped input and drag-and-drop exercises, learners manipulate graphical components to align with specific prompts. This active engagement fosters a deeper connection with the material while facilitating the development of critical thinking skills.

3. **Text Input (Fill-in-the-Blank):** By seamlessly integrating text input assessments, learners are prompted to apply their knowledge in constructing coherent responses. This format encourages learners to articulate their understanding in their own words, fortifying their grasp of concepts and promoting higher-order thinking.

4. **Open Response Assessment (ORA) Problems:** The platform's embrace of open response assessment fosters a comprehensive exploration of complex topics. Learners are encouraged to provide in-depth, qualitative responses that showcase their analytical prowess and ability to synthesize information from various sources. This format nurtures creativity and encourages learners to develop a deeper understanding of the subject matter.

5. **Case Studies:** The inclusion of case studies infuses real-world relevance into the learning experience. Learners are immersed in scenarios that mirror authentic challenges, prompting them to apply theoretical knowledge to practical situations. This experiential approach hones problem-solving skills and cultivates a deeper appreciation for the material's practical applications.

All of these assessment exercises are designed to seamlessly integrate with the platform's auto-grading functionality. Learners benefit from instant feedback, enabling them to gauge their progress and identify areas for improvement. The platform's learner-centric approach extends to multiple attempts, augmented by helpful hints and comprehensive solutions. This multifaceted support system amplifies the efficacy of feedback, empowering learners to navigate a continuous cycle of learning and refinement.

Grades and assignments

Through the LMS users are also able to define a grading system as follows:

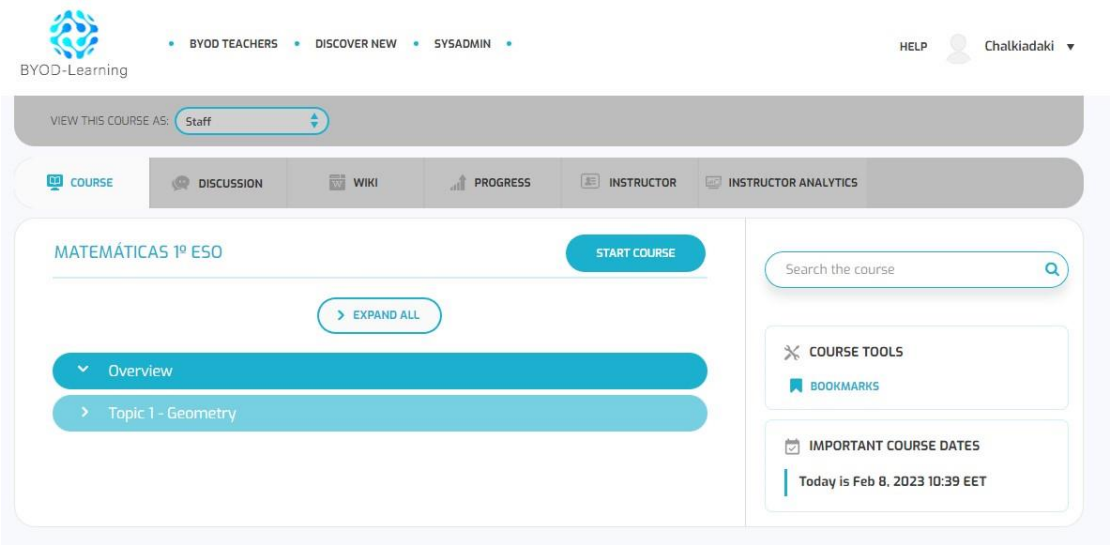
1. **Customized Graded Exercises:** Users wield the ability to meticulously tailor the nature of graded exercises featured within their Course. By harnessing this feature, educators and administrators can curate a diverse and impactful spectrum of exercises, spanning quizzes, assignments, projects, and more.
2. **Flexible Weightage Allocation:** The LMS provides a flexible system for users to assign different weights to exercises in the final grade. This helps educators create a balanced grading structure, making sure each exercise contributes effectively to evaluating students' overall academic performance.
3. **Submission Deadlines:** Within the LMS, users can define and enforce submission deadlines for exercises. This ensures a coherent and structured learning progression, enabling learners to effectively engage with exercises while cultivating effective time management skills.
4. **Tailored Grading Policy:** The LMS allows users to create a detailed grading policy that outlines the specific standards and guidelines for evaluating exercises. This user-controlled approach promotes a fair and clear assessment system that aligns with educational principles.

Additional Features

The Learning Platform offers various additional features to enhance the learning experience, including:

1. **Discussion Forums:** Engage in meaningful discussions with fellow learners, sharing insights and exchanging ideas on course topics.
2. **About Page:** Access comprehensive information about the course, its objectives, and the educators guiding your learning journey.
3. **Progress Page:** Keep track of your learning progress, monitor completed tasks, and stay organized throughout the course.
4. **Instructor Tab:** Connect directly with your instructors, seeking guidance and clarifications on course content whenever needed.
5. **Instructor Analytics Tab:** Access valuable insights into your learning patterns and performance, enabling informed decisions to enhance your academic journey.

These functionalities collectively contribute to an enriched and comprehensive learning environment, fostering a seamless and engaging educational experience.



1.8 Technical aspects of the Learning System

Learners seamlessly navigate their educational journey through the Learning Management System (LMS). Within the LMS, the instructor dashboard emerges as a central command center, accessible to users endowed with Admin or Staff roles. The dashboard, accessed via the "Instructor" selection, empowers educators with a comprehensive overview of their courses, enabling streamlined course management, content delivery, and student engagement.

Behind the scenes, the LMS relies on a robust framework of data stores. Courses find their digital abode within the MongoDB repository, while video content seamlessly integrates from dynamic sources such as YouTube and Amazon S3. Personalized learner data, a cornerstone of tailored instruction, is securely stored within MySQL databases, ensuring a structured and efficient storage solution.

On the architectural front, the LMS harmoniously blends a plethora of technologies. Django server-side code leverages Mako for fluid front-end template generation, while browser-side dynamics are fuelled by JavaScript, supplemented by CoffeeScript. The ongoing technological evolution is evidenced by the transition to the Backbone.js framework, enhancing interactivity and code maintainability. For aesthetic, the BYOD VLE's visual landscape is meticulously crafted using Sass and the Bourbon framework, facilitating a harmonious convergence of aesthetics and functionality.

The course authoring tool is seamlessly interwoven through Studio, a dynamic environment that empowers course teams to shape, refine, and update the curriculum. Studio's course creation endeavors converge with the same MongoDB repository utilized by the LMS, creating a seamless bridge between content creation and content delivery.

Course discussions are managed within the LMS ecosystem through an entity known as "comments," especially designed to foster interactive discourse. Comprising a non-Python

component, comments are orchestrated through Ruby and the Sinatra framework, accentuating the platform's versatility. An API from the comments service seamlessly integrates discussions into the learner's course experience, nurturing a dynamic exchange of ideas.

Additionally, the comments service includes notifications to keep learners updated on topic developments. A dedicated notifier process sends notifications, enhancing learner engagement and strengthening their dedication to learning.

For developers, the BYOD VLE extends a spectrum of installation options. The Open edX software can be seamlessly integrated using Docker, with two prominent choices:

1. **Open edX Developer Stack (Devstack):** Devstack, an assembly of Docker containers tailored for local development, provides a vibrant sandbox for developers to experiment and innovate.
2. **Open edX Analytics Developer Stack (Analytics Devstack):** Tailored to run Open edX Analytics, Analytics Devstack is a modified version of the Devstack installation, enhancing the platform's analytical capabilities.

1.9 HTML Components

HTML, which stands for HyperText Markup Language, serves as the foundational standard for crafting web pages, enabling the creation of dynamic and interactive online content. When rendered by web browsers, HTML code undergoes a transformation, translating intricate instructions into a visually coherent and comprehensible format that users can readily engage with and navigate.

Within the context of the BYOD course framework, HTML components emerge as the fundamental elements that underpin the course content's construction. The BYOD consortium uses the HTML components to seamlessly incorporate and structure various essential elements, thereby crafting an engaging and informative learning experience for participants.

The versatility of HTML components extends to a diverse array of content elements that enrich the learning environment. These components facilitate the seamless embedding of textual content, allowing instructors to convey information, instructions, and insights with clarity and precision. By skilfully integrating hyperlinks, HTML components empower learners to explore supplementary resources, delve deeper into subject matter, and access external references that amplify their understanding.

Furthermore, HTML components easily add multimedia like images for clear concepts, infographics for simplified data visuals, and videos for dynamic explanations. This multimedia mix boosts engagement, allowing learners to absorb information through various senses, deepening their connection with the course content.

By using HTML components, the BYOD course transforms from static text to an interactive space where learners actively engage. These components offer a versatile toolkit for shaping content, matching learning goals and preferences. Essentially, HTML components form the foundation for assembling the course, allowing instructors to create a captivating learning journey that goes beyond traditional methods. Through strategic use, HTML components empower instructors to enhance comprehension, retention, and overall impact on participants' education.

1.10 Conclusions

Through the strategic utilization of the Bring Your Own Device Virtual Learning Environment (BYOD VLE), educators are equipped with a dynamic toolkit that enables the creation of engaging and immersive learning sequences. This strategic utilization empowers educators to curate an educational experience that surpasses traditional teaching methods, generating an increased level of active participation and fostering a sense of curiosity and exploration among learners.

The BYOD VLE also offers students a versatile learning journey by blending instructional content with practical tasks. Learners can switch between absorbing new ideas and doing exercises to check their understanding. This helps them grasp the subject and builds confidence as they progress.

A significant aspect of this pedagogical approach is its focus on personalized progress. The BYOD VLE caters to different learning speeds and styles, allowing students to shape their own learning paths. This self-directed approach fosters engagement and motivation.

2. Development of the methodology and educational approach

2.1 The Dynamic Vision of the European BYOD-Learning Platform

The concept underlying the European E-platform revolves around introducing an innovative alternative to traditional classroom learning – a flipped-classroom model facilitated by video lessons that comprehensively cover the curriculum. This initiative aims to address two fundamental objectives:

1. **Digital Learning Solution:** The platform seeks to embrace the digital landscape to enhance the learning experience. It provides educators with a resource-rich environment to enhance their teaching methods and materials, ultimately elevating their effectiveness.
2. **Support for Mixed-Ability Classes:** The platform serves as a catalyst for inclusivity, extending its influence beyond the classroom. It aims to empower students of varying skill levels by nurturing their core competencies, ensuring no one is left behind in the pursuit of knowledge.

The project's ambition is twofold, focusing on two distinct target groups:

1. **Empowering Educators:** The goal is to help educators and teaching professionals by providing them a variety of digital materials and tools. This repository equips them to navigate their teaching responsibilities more effectively and efficiently, enriching their instructional approach.
2. **Nurturing Students:** The initiative extends its impact to students with mixed ability knowledge, by nurturing essential competencies. By doing so, it fosters a culture of inclusivity in the learning process, reinforcing the idea that every learner's unique capabilities are valued.

The European BYOD-Learning platform introduces a layer of added value through its dynamic nature. It functions as a flexible, ever-evolving entity capable of accommodating a diverse array of subjects, grade levels, and languages. This adaptability ensures that the platform remains relevant and aligned with the evolving educational landscape.

Central to the BYOD Learning platform and methodology is its emphasis on hyper-personalization. The approach underscores the idea that effective learning transpires when instructional methods align with individual learning styles. Through the utilization of video materials and digital tools, each student is provided with a tailored learning experience. This approach empowers learners, enabling them to dictate their learning pace and fostering a sense of achievement and success. The BYOD model embodies a learner-centric paradigm, wherein students are granted the autonomy to plan their learning course. It encourages self-directed learning, enabling students to select learning pathways that resonate with their unique interests and abilities.

Crucially, the BYOD Learning platform and methodology confront educational disparities directly. By prioritizing the development of key competencies and fostering inclusivity, it works to narrow

the gap in learning outcomes, particularly among underachieving students. The platform's multifaceted approach ensures that every learner, regardless of their starting point, is equipped with the tools and opportunities to thrive.

In essence, the European E-platform with its BYOD-Learning initiative represents a pioneering stride towards an inclusive, personalized, and impactful educational landscape. Through its innovative methodology, it aspires to reshape the educational paradigm, not only by leveraging technology but by nurturing a holistic and equitable approach to learning and growth.

2.2 Concrete Objectives of the project

The project has set a clear and comprehensive set of objectives, each aimed at transforming the landscape of mathematics education while embracing modern technological advancements. These objectives encompass a range of critical areas, fostering an innovative and impactful educational environment:

1. **Innovative Teaching Approach:** The project seeks to pioneer a ground-breaking approach to math education, integrating a methodology rooted in best practices. This initiative will not only enhance teaching techniques but also upgrade the learning experience.
2. **Equity in Learning Outcomes:** Addressing disparities in learning outcomes is a core objective, especially for students who may be underachieving. By implementing strategies that bridge gaps in knowledge, the project aims to ensure every learner is given an equitable opportunity to succeed.
3. **Leveraging ICT-based Methods:** Incorporating information and communication technology (ICT) methodologies will introduce a new dimension of engaging education. By integrating Open Educational Resources (OER) and digital tools, the project aims to create a more captivating and appealing learning atmosphere.
4. **BYOD E-Platform Creation**: A pivotal goal has been the establishment of the European e-platform for mathematics education, utilizing the Bring Your Own Device (BYOD) approach. This platform enables flexible and accessible learning, embracing the digital era and catering to diverse learning styles.
5. **Enhanced Assessment of Competences:** The project aims to revolutionize the assessment of key competencies, particularly in mathematics and digital skills. By introducing innovative assessment methods, learners' true capabilities will be accurately evaluated.
6. **Holistic Student Competencies:** Developing not only subject knowledge but also personal, social, and learning-to-learn competencies is a crucial aspiration. This well-rounded approach ensures students are equipped with skills that extend beyond the classroom.
7. **Professional Development of Educators:** The project recognizes the significant role of teachers in shaping education. By enhancing their professional development, educators will be equipped to create dynamic and effective learning environments.

8. **Digital Learning Models:** The project aims to empower schools and teachers to seamlessly transition to digital-supported learning environments. This adaptability will enable the implementation of hybrid or distance learning models as needed.
9. **Empowering Educators:** Providing educators with a competence framework tailored to digital and hybrid learning environments will empower them to navigate this transformative shift with confidence and efficacy.

The innovative aspect of this project lies in the individualized approach to content design. By tailoring video lessons to three different time durations, the project accommodates learners of varying abilities. More specifically, video lessons are designed in 15-minute videos for the overachievers in Math, 30-minute videos for the average students, and 45-minute videos for the underachievers. This inclusivity not only supports weaker students in their learning journey but also challenges high-achievers to excel. Moreover, the integration of contemporary technologies enriches the teaching process, fostering creativity and engagement among instructors.

In addition to these objectives, the project envisions a paradigm shift in learning dynamics:

1. **Flexible Learning:** Learners will have the flexibility to engage in learning anytime and anywhere, breaking the traditional constraints of time and place.
2. **Personalized Learning:** Education will be tailored to each student's individual needs and preferences, promoting a more effective and engaging learning experience.
3. **Student-Centered Approach:** Students will have the autonomy to choose how they learn, promoting ownership and motivation in the learning process.
4. **Leveraging Technology:** Technological advancements will be harnessed to facilitate effective learning, opening doors to acquiring skills that involve both human knowledge and face-to-face interaction.
5. **Data Interpretation:** Students will develop skills in interpreting data, applying theoretical knowledge to real-world scenarios and honing their analytical thinking.
6. **Diverse Assessment:** Traditional assessment methods will evolve, accommodating new forms of evaluation that better reflect students' abilities and potential.
7. **Independent Learning:** A focus on cultivating independent learning skills will empower students to take charge of their education journey.

3. Objectives of the Learning Videos

The pervasive impact of digital videos on students' daily lives cannot be overstated. In today's era, educational videos have become an indispensable tool for acquiring knowledge across a broad spectrum of subjects. Recognizing this trend, the BYOD-Learning project has undertaken the ambitious effort of crafting educational video lessons that encompass the mathematical curriculum tailored for 7th-grade students. This initiative is driven by a vision to create an innovative flip-classroom learning environment, poised to serve multifaceted objectives with profound implications:

1. **Fostering Flexible Digital Learning:** At the heart of this project lies the aspiration to nurture a realm of flexible digital learning and knowledge dissemination within the confines of school environments. This approach dismantles conventional boundaries, enabling students to access learning materials seamlessly and at their convenience.
2. **Empowering Anytime, Anywhere Learning:** The BYOD-Learning project seeks to empower learners with the ability to engage in education irrespective of time, place, or device. This visionary approach not only enhances accessibility but also cultivates a culture of continuous learning beyond the confines of traditional classrooms.
3. **Resilient Learning Solutions:** The project's significance amplifies in times of crisis, as it offers a robust learning solution that transcends challenges, such as the ongoing pandemic. By providing an avenue for uninterrupted education, it ensures that students remain connected to learning even in the face of unprecedented circumstances.
4. **Nurturing Communication Skills:** The introduction of learning video lessons introduces an original dimension to pedagogy, necessitating teachers to refine their communication skills. This initiative stimulates a transformative shift in educators' methods, equipping them to effectively engage with learners through dynamic visual content.
5. **Driving Digital Transformation in Schools:** The BYOD-Learning project serves as a catalyst for driving digital transformation within educational institutions. This progressive shift integrates technology seamlessly into the learning process, preparing students for a digital future while augmenting educators' capabilities.
6. **Transitioning to STEAME Education:** With a broader perspective in mind, this initiative also fuels the transition to STEAME education—an integration of Science, Technology, Engineering, Arts, Mathematics, and Entrepreneurship. By infusing diverse disciplines, it enriches the learning experience and empowers students with a holistic skill set.
7. **Embracing EDUCATION 4.0:** The project is a pivotal contributor to the transition towards EDUCATION 4.0, where innovation and technology harmonize with education. This holistic approach leverages advanced tools and methodologies to prepare students for the demands of an ever-evolving global landscape.

3.1 Objectives of utilizing learning videos in Mathematics and beyond

The utilization of learning videos in Mathematics and other subjects is driven by a comprehensive array of objectives, collectively aimed at fostering an innovative and effective educational landscape:

- **Innovative Teaching Approach:** The primary goal is to pioneer a dynamic teaching approach in Mathematics, leveraging the power of learning videos to engage and empower students.
- **Addressing Learning Disparities:** An essential objective is to mitigate disparities in learning outcomes that impact learners across the spectrum, ensuring that every student has an equitable opportunity to excel.
- **Integration of ICT-based Methodologies:** By embracing Information and Communication Technology (ICT), the project aspires to introduce cutting-edge methodologies for teaching and learning Mathematics.
- **Enhanced Education through Digital Tools:** The incorporation of Open Educational Resources (OER) and digital tools seeks to enhance the attractiveness and effectiveness of education and training.
- **Development of Key Competencies:** A pivotal aim involves nurturing students' foundational competencies, with a particular focus on mathematical and digital competence.
- **Holistic Competency Cultivation:** The project aims to foster the holistic growth of students by cultivating personal, social, and learning-to-learn competencies.
- **Professional Development of Educators:** Enhancing the skills and expertise of educators is a key facet, enabling them to navigate evolving educational paradigms effectively.
- **Transition to Digital Learning:** By enabling educators and schools to transition seamlessly to digitally supported environments, the project promotes the implementation of distance and hybrid learning models.
- **Empowering Teachers for Change:** The establishment of a competence framework empowers teachers to adeptly navigate the transition to distance and hybrid learning settings, ensuring a smooth educational continuum.
- **Customized Learning Styles:** A crucial aspiration is to enhance learning outcomes by accommodating diverse learning styles, capitalizing on each student's unique approach to learning.
- **Personalized Learning Pathways:** The project offers students a personalized learning experience, granting them autonomy over their pacing and enabling them to chart their learning pathways.
- **Alternative Learning Models:** By providing students with diverse learning models beyond traditional textbooks, the project seeks to invigorate and diversify the learning process.

- **Integration of Technology:** Harnessing the potential of fast-moving technology, the project ushers the era of technological integration into the classroom.
- **Student Engagement and Competency Acquisition:** Learning videos aim to captivate students' attention, facilitating the acquisition of essential skills and competencies.
- **Transformation of Group Learning:** The project introduces a pedagogical transformation, shifting from conventional group learning to a more individualized and tailored learning environment.
- **Dynamic Interactive Learning:** The ultimate objective is to establish a dynamic and interactive learning ecosystem, cultivating engagement and fostering a profound connection with the subject matter.

Collectively, these objectives underscore the project's commitment to reshaping education, by focusing on innovation, inclusivity, and personalized learning experiences that prepare students for the challenges and opportunities of the future.

The project introduces an innovative approach distinguished by its creation of mathematical learning content, uniquely tailored to cater to diverse student needs. Two distinct types of scenarios are encompassed, each contributing to a comprehensive and adaptive learning experience:

TYPE A: Addressing Different Levels of Ability

1. For those excelling in mathematics, 15-minute videos provide a succinct and focused learning experience.
2. Average students benefit from 30-minute videos that delve deeper into concepts, offering comprehensive coverage.
3. Underachievers in math are supported by 45-minute videos, affording ample time for in-depth understanding and practice.

TYPE B: Tailoring Elaboration Styles

In addition to catering to varying levels of ability, the project introduces an equally innovative dimension by crafting learning content that corresponds to different styles of elaboration:

4. Initiation is facilitated through 15-minute videos, providing a concise introduction to the core concepts and materials in math.
5. The subsequent 30-minute videos offer a more comprehensive elaboration, delving into the theory and practical application of mathematical principles.
6. For those seeking further enrichment, 45-minute videos extend the elaboration process, offering an array of additional examples and exercises to reinforce understanding.

By considering both different levels of ability and distinct styles of elaboration, the project not only accommodates the diverse learning preferences of students but also empowers educators to tailor their teaching methods for maximum impact. This innovative framework represents a significant leap forward in educational methodology, fostering a dynamic and engaging learning environment that optimally caters to the unique needs of every learner.

3.2 Objectives of the 15-minute learning videos

The goals of the short 15-minute educational videos include various ways to enhance mathematical knowledge:

- **Comprehensive Introduction:** The primary purpose is to introduce students to new mathematical concepts in a concise and consolidated manner, providing them with an initial exposure to the subject matter.
- **Knowledge Reinforcement:** These videos serve as a tool to reinforce and recall students' existing mathematical knowledge pertaining to specific content areas, ensuring a strong foundation.
- **Knowledge Advancement:** By delving into targeted mathematical topics, the videos aim to elevate and expand students' comprehension and expertise in particular areas of mathematics.
- **Bridging Knowledge Gaps:** An important objective is to bridge any existing knowledge gaps that students might have in their mathematical understanding, fostering a more seamless learning progression.
- **Inclusion of High Achievers:** These videos play a pivotal role in engaging and challenging higher-ability students, providing them with opportunities to delve deeper into complex mathematical challenges.

Through these objectives, the 15-minute learning videos contribute to an enriched and inclusive mathematical learning experience. Students are introduced to new concepts, their existing knowledge is reinforced, and any gaps in understanding are addressed. Furthermore, these videos offer a platform for higher-achieving students to engage in more advanced mathematical exploration, promoting a diverse and comprehensive learning environment.

3.3 Objectives of the 30-minute learning videos

The purposes of the 30-minute learning videos extend to several valuable educational aspects:

- **Comprehensive Introduction with Practical Examples:** The primary aim is to introduce students to new mathematical concepts, not only in theory but also through practical, real-world examples. This approach helps students see how these mathematical ideas are used in different situations.

- **Application of Mathematical Concepts:** These videos aim to demonstrate the practical application of the learned mathematical content. By solving various problems and exercises, students gain a deeper understanding of how these concepts can be used to solve real-life challenges.
- **Reinforcement of Existing Knowledge:** These videos also serve as a means to reinforce and refresh students' existing understanding of specific mathematical content, ensuring that foundational knowledge is solidified.
- **Addressing Knowledge Gaps:** An important goal is to fill in any gaps that students may have in their mathematical knowledge, helping them build a more complete and connected understanding.

Through these objectives, the 30-minute learning videos offer an engaging and comprehensive approach to mathematical learning. Students not only grasp new concepts but also witness their practical application, enhancing their problem-solving skills. Additionally, these videos contribute to reinforcing existing knowledge and ensuring a well-rounded understanding of specific mathematical topics.

3.4 Objectives of the 45-minute learning videos

Similarly, the objectives of the 45-minute learning videos encompass a range of educational benefits:

- **Comprehensive Theoretical Presentation with Examples:** The primary aim is to introduce students to new mathematical concepts through detailed theoretical explanations accompanied by a multitude of illustrative examples. This approach helps students grasp the theoretical foundations and witness practical instances of the concepts in action.
- **In-depth Application and Problem-Solving**: These videos aim to showcase how the acquired mathematical knowledge can be practically applied. Through the resolution of a diverse range of mathematical problems, varying in complexity, students not only master the content but also develop strong problem-solving skills, honing their ability to tackle diverse challenges.
- **Mastery of Problem-Solving Techniques:** The objective is to enable students to become adept at specific problem-solving approaches. By engaging with a variety of problems and exploring various solution methods, students enhance their proficiency and versatility in tackling mathematical challenges.
- **Reinforcement of Existing Knowledge:** Similar to the shorter videos, the 45-minute videos also serve as a means to reinforce and consolidate students' existing understanding of specific mathematical content, ensuring a solid grasp of fundamental concepts.
- **Addressing Knowledge Gaps and Cultivating Autonomy:** An important focus is on bridging any gaps in students' mathematical knowledge while simultaneously fostering skills for self-directed learning. These videos aim to develop students' ability

to study independently, take ownership of their learning tasks, and assume responsibility for their educational journey.

- **Motivating Engagement and Participation:** Through comprehensive explanations and a focus on detailed instruction, these videos aim to motivate and engage students who may have been struggling or disinterested in mathematics. By presenting content in a more elaborate manner, these videos strive to spark interest and active involvement among students.

In essence, the 45-minute learning videos provide a rich and comprehensive learning experience. They go beyond theoretical presentation and delve into practical applications, nurturing problem-solving skills and instilling a sense of autonomy in students. These videos offer a valuable resource for mastering mathematical concepts, addressing gaps in understanding, and encouraging self-driven learning.

3.5 The benefits of using learning videos as an educational tool

Educational videos offer a dynamic and immersive learning experience that goes beyond traditional print materials. These videos engage multiple senses, making learning more captivating and interactive. The versatility of videos is notable, as they can be accessed on various devices such as laptops, tablets, and smartphones, enabling students to learn conveniently at their own pace and location. This adaptability is particularly beneficial for students who require additional processing time, as they can pause, rewind, and replay videos as needed. Those who thrive on repetition can watch the videos repeatedly, reinforcing their understanding.

Taking personalized learning a step further, students can take notes according to their preference and tempo, fostering a sense of ownership over their learning journey. Closed captioning ensures that students with hearing impairments can fully participate, while transcripts cater to those who benefit from written notes. Importantly, videos open doors to innovative teaching methods like the flipped classroom model or blended learning, transforming teachers into facilitators of interactive learning experiences.

The scope of video lessons extends beyond the classroom walls, enabling teachers to extend their reach to students worldwide through remote learning. It's crucial to understand that videos are intended to complement and enrich traditional course materials and lectures, rather than replace them. A well-crafted video can infuse fun, motivation, and education into the learning process, offering a refreshing break from conventional classroom routines. Moreover, producing videos provides educators with opportunities to diversify information delivery, ensuring that students can access content through various channels. In this digital age, educational videos serve as a valuable tool that enhances learning accessibility, engages students, and empowers educators to adapt and innovate in their teaching practices.

4. Testing of the BETA Version

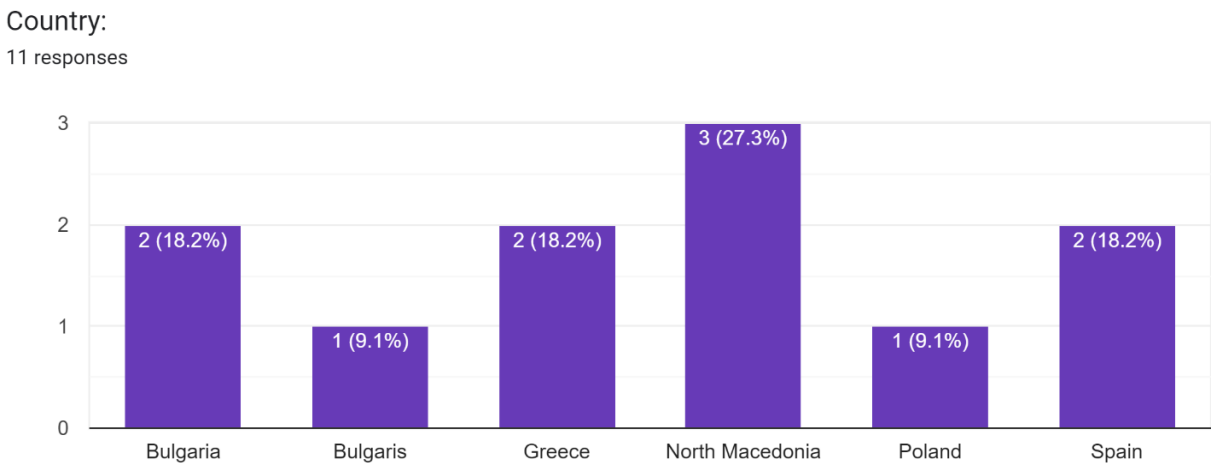
4.1 BETA testers profile

The BYOD-Learning Consortium opted to employ a beta testing methodology for its MOOC with the title "BYOD- Learning at Any Time, at Any Place via any Device". Beta testing was vital for evaluating the level of participant satisfaction with the end product by letting it be validated by the end-users, who actually use it, over a period of time. Beta testers were asked to give feedback on design, functionality, and usability, which significantly contributed to the evaluation of the MOOC's overall quality.

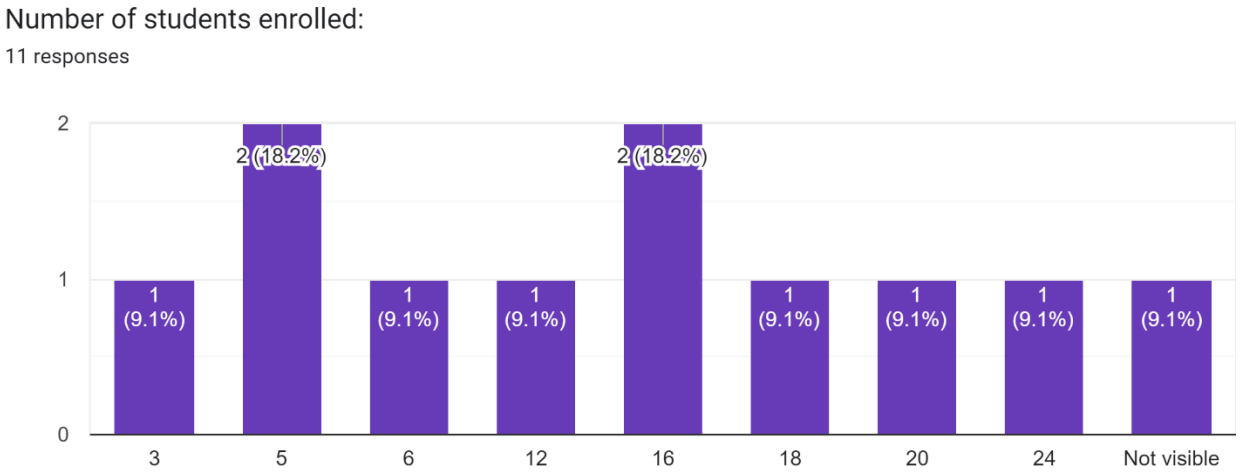
A total of 103 persons piloted the platform. Beta testers comprised of approximately two participants per partner organization and 92 7th grade students who actively participated in the MOOC across various available courses in English, Bulgarian, Spanish and Greek. To ensure a comprehensive feedback collection process, two distinct Google Forms were sent out, reflecting sets of questions tailored to the specific audience (one for Teachers and one for Students). This approach was undertaken to effectively address the varying insights each group could offer.

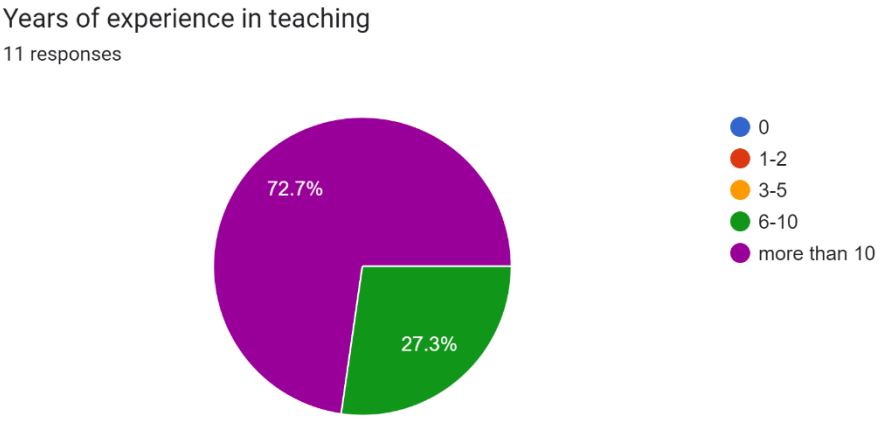
4.2 BETA Testing Form: Demographics of Teachers

In particular, three teachers from Bulgaria, two from Greece, one from Poland, three from N. Macedonia and two from Spain provided their feedback, representing the Organisations 5 OU Ivan Vazov, Plovdiv University, Doukas School, the Pedagogical University of Krakow, AMETA and IES Arcebispo Xelmírez II, respectively. The respondents have extensive experience in the field of Math education and e-learning education and their background underscores their capability to provide valuable insights and perspectives on the functionality and quality of the platform.



Teachers, as beta testers, also managed to enroll students in the platform's available courses in order to pilot it in their turn. The majority of them already have more than 10 years experience in teaching and as such, their feedback is considered valuable for the piloting phase of the BYOD-Learning project.





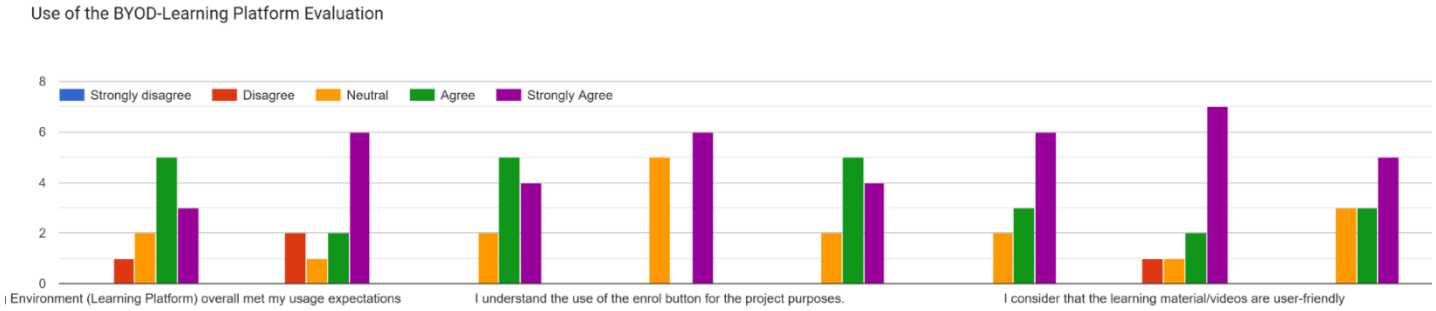
4.3 BETA Testing Form: Demographics of Students

A total of 92 students were guided through and actively participated in the courses provided by the BYOD platform. Breaking down the numbers, 26 of them reported that they come from Bulgaria, 24 from Poland, 19 from Greece, 17 from Spain and 6 from N. Macedonia. Students come from different schools, namely: ""5th Ivan Vazov" Primary/Elementary/Middle School", 7th High School of Crakow, Blaze Konenski, Doukas School, IES Arcevispo Xelmírez II, OU "Raina Knyaginya" and SOU Gimnazija Koco Racin Veles.

4.4 Statistical information

Beta testers were asked to provide their feedback through two distinct BETA Testing Forms – one designed for teachers and one for students. The answers are depicted in the following diagrams.

4.5 BETA Testing Form: Teachers' Evaluation Results



Questions:

1. The BYOD Learning Environment (Learning Platform) overall met my usage expectations
2. The Landing page of the BYOD E-Learning Environment is easy to navigate
3. The registration form collects all the data that I understand the need to provide
4. I understand the use of the enrol button for the project purposes.
5. The course I created is present on the BYOD-Learning Environment and is to my satisfaction
6. The Course Authoring Tool (Studio) meets my needs so that I can upload and control my teaching material/videos
7. I consider that the learning material/videos are user-friendly
8. I plan to continue using the BYOD Learning Environment for my future teaching

In all questions, the majority of Beta-testers responded with the highest rate "strongly agree" (with the exception of questions 1, 3 and 4, where the majority replied that the "agree"). These results show high confidence in their understanding of the use of the BYOD Learning platform and the Course Authoring Tool (Studio) as well as their satisfaction in terms of platform functionalities, structure, outline and design.

Moreover, the platform testers were asked to provide in written their feedback in case they had further comments/suggestions on how to improve the BYOD-Learning Environment/Platform:

"Access should be more open. After registration I had to wait almost 2 weeks for acceptance of my account and I could not work immediately."

"For the future, I think that the duration of the videos should be changed. I consider that a 15 minutes video is even too long for the students. My suggestion is put small duration videos, about 5 minutes, and build a lection with more than three videos."

"It would be better if the videos were shorter so that students could easily watch them. Also, by making them shorter it will attract more teachers to use the platform as in general the idea of creating short videos is ideal for the students. I would also suggest more flexibility when it comes to assessment."

"Make a GDPR compliance form that needs to be signed by parents so that students will be able to give their real names in case they are allowed to. Also, make a forum where students and teachers. Everything else is really well structured. Great work!"

The rest of the Beta testers stated that they had no comments.

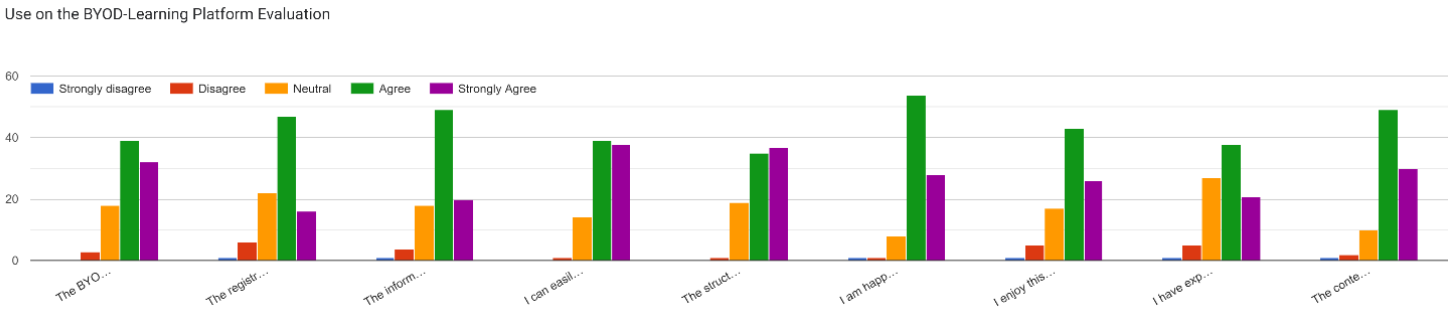
4.6 Taking the next steps

It should be noted that the consortium was made aware of the piloting outcomes and the specific feedback provided, which opened up the option to contemplate altering the approach or to implement enhancements.

Identified issues in terms of access were clarified to the consortium and a solution was proposed. Moreover, the *Privacy Policy* incorporated in the platform as well as the *Terms of Service* and the *Honor Code* already cover the *GDPR* compliance request.

In addition, based on the responses, it is evident that a considerable number of testers was unsure about the use of the enrolling button. For this reason, Skybridge took action so that this point was clarified to the consortium and was included in the guidelines addressed to the public (in the "BYOD TEACHERS" section on the BYOD Learning platform).

4.7 BETA Testing Form: Students' Evaluation Results



Questions

1. The BYOD Learning Environment (Learning Platform) overall is easy to navigate
2. The registration form collects data that I am happy to provide
3. The information available for the platform course prior to registering/enrolling is useful
4. I can easily access the lesson of my school/class
5. The structure of the course was easy to navigate
6. I am happy with the quality of the learning video content
7. I enjoy this method of learning
8. I have expanded my skills in e-learning platforms use
9. The content is presented in an interesting way

In all questions, the majority of Beta-testers (students) responded that they "agree" (with the exception of question 5, where the majority replied that the "strongly agree"). These results show high satisfaction and understanding of the platform use, navigation, functionalities, structure, content, as well as the methodology the consortium has chosen to implement via the BYOD learning project.

4.8 Problems identified and general comments

The respondents were asked to provide their feedback in case of any further comments/suggestions on how to improve the BYOD-Learning course structure as well as the learning videos:

Comments/suggestions on how to improve the learning videos:

Although the platform rating was high, students have had suggestions on how the videos could improve which on the one hand shows their high level of engagement and on the other hand, their expectations about which the consortium was promptly informed. Out of the 92 answers received, here are the most significant ones:

“Maybe they could be shorter”

“They are too long (5-10 minutes would be better).”

“They are helpful”

“I think the learning videos are very well made, and the teacher explanations are great!”

“Do video's more videos for 7 graders”

“it helped me with the exams”

“make the videos more interactive. e.g stop the videos and add a question and only if the answer is correct the video continues”

The majority of students either answered that they have no comments or that videos are too long, something that was highlighted by the Teachers Beta testers as well and acknowledged by the BYOD consortium.

To some extent, the provided feedback went beyond the project scope and unfortunately was not possible to be met as an expectation. For example:

“You can put tests in every lesson so we can practice.”

“Add a chat between students and one between students and teachers. Give badges when we complete the videos. More exercises for practice in the comments in the form of pdfs.”

Comments/suggestions on how to improve the structure of the course:

In this question, students had less comments or comments of minor significance in terms of improvements, yet they expressed their satisfaction from their experience:

“The topics should be expanded by default.”

“The background of the platform can be more colorful. This inspire the kids to learn more.”

“I think the structure of the course is very good!”

“Maybe it should be made a little easier to log into the accounts.

“I think it is good and doesn't need any big improvements.”

There were also comments that were not applicable as they described functionalities that already existed in the platform:

“There could be a bar that marks your progress of the selected courses.”

“Add a forum for students.”

4.9 Final Conclusions

The answers highlight the existing need for a platform as the one the BYOD Learning project has introduced, and thus, the students welcomed it by being ready to use it in a way that would be closer to their needs and habits. Moreover, it seems that that they were keen to see more lessons on the platform on top of showing their engagement in the process of piloting as well as to future involvement.

Findings show that the BYOD Learning project has captured a long-standing need and that students were ready to collaborate and share ideas showing their enthusiasm for the newly introduced method of learning by the BYOD consortium.

ANNEX I – Google Form for Teachers

The evaluation questionnaire can be found here.

- Profession (i.e. Mathematician)
- Title of Course tested
- Country
- Trainer
- Evaluation Form submitted by (Please insert your first & last name)
- Please insert your e-mail address
- Number of students enrolled
- Your organization (Please insert the organization you represent, if applicable)
- Years of experience in teaching
- The BYOD Learning Environment (Learning Platform) overall met my usage expectations
- The Landing page of the BYOD E-Learning Environment is easy to navigate
- The registration form collects all the data that I understand the need to provide
- I understand the use of the enrol button for the project purposes.
- The course I created is present on the BYOD-Learning Environment and is to my satisfaction
- The Course Authoring Tool (Studio) meets my needs so that I can upload and control my teaching material/videos
- I consider that the learning material/videos are user-friendly
- I plan to continue using the BYOD Learning Environment for my future teaching
- Comments/suggestions on how to improve the BYOD-Learning Environment/Platform:

ANNEX II – Google Form for Students

The evaluation questionnaire can be found here.

- Grade
- Title of course tested
- Teaching facilitator of the course
- Country
- Evaluation form submitted by
- Please insert your email address
- Please insert the school name where you area a student (i.e. 2nd High School of Gerakas):
- The BYOD Learning Environment (Learning Platform) overall is easy to navigate
- The registration form collects data that I am happy to provide
- The information available for the platform course prior to registering/enrolling is useful
- I can easily access the lesson of my school/class
- The structure of the course was easy to navigate
- I am happy with the quality of the learning video content
- I enjoy this method of learning
- I have expanded my skills in e-learning platforms use
- The content is presented in an interesting way
- Comments/suggestions on how to improve the learning videos
- Comments/suggestions on how to improve the structure of the course

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