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Socio-Cognitive Awareness of Inmates through an Encrypted Innovative Educational Platform

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Abstract. This research examines the educational challenges encountered by second-chance school students in the correctional facility during the pandemic. The opportunity to utilise a specialised digital interconnection facility with the eLearning Platform deprived offenders of the right to equal access to education. Using open-source software, a unique encrypted platform that enables distance learning, while preventing access to any other portion of the internet, besides the learning process, has been created. The findings of the review highlight the possibility of educating and training socially excluded individuals, such as prison inmates, through innovative learning techniques. Innovative education and learning techniques, such as Gamification, enhance inmates' attitudes in their cognitive and emotional dimensions. The innovative and secure platform enables inmates attending alternative schools, to assert their inherent right to information and lifelong learning. This study proposes a gamified perspective for educational access and lifelong learning. In conclusion, it was determined that the implementation of innovative learning methods with Gamification in distance learning education via the suggested encrypted platform, is a motivating lever for student-inmates, thereby boosting key skills, such as emotional, social, socio-cognitive awareness, leadership, and digital skills.

Keywords: socio-cognitive awareness; gamification; cognition; inmates; Distance-Learning Education; encrypted platform; pandemic

1. Introduction

Throughout a person's life, there is a need to improve/maintain one's skills, in order to manage the demands arising from the various challenges in many areas of life, such as economic, demographic, technological, social, and environmental challenges. On this basis, education/learning, as a whole and lifelong learning, mean that there is a need for continuous education and renewal of knowledge (Innovation Quarterly, 2016) as a response to current socio-economic data. Many supranational organisations, such as OECD, UNESCO, and the European Union, promote lifelong learning, in order to complement the knowledge that society and the various social, economic, and educational changes need, resulting from broader developments (Kehm, 2015).

In addition, the flexibility of digital education is a significant advantage and a motivation for many people. The main reason is that it theoretically facilitates attending classes, especially when one's physical presence may now be difficult, or even impossible.

Second-Chance Schools are aimed at adult inmates who have not completed compulsory education, i.e., High School. By attending Second-Chance Schools – which last for two years – they can obtain a high school diploma equivalent to that of High School. It also allows them to serve two days of their imposed sentence for each day of schooling. Notably, based on the national statistics authority, 72% of those released from prison return to prison, while the corresponding percentage of inmates who have attended Second-Chance Schools amounts to 10% (Duguid, 2000).

Accordingly, in other European countries, programs similar to those of second-chance schools have been implemented regarding inmates' reintegration. Specifically, in Norway, the "Internet for Inmates" program was created, as a continuation of another broader Grundtvig Program entitled "Co-operation in Prison Education – Learning in a Network Environment (PIPELINE)." The program aimed to improve the quality of education in prisons by enabling inmates to access and use Information and Communication Technology (European Commission, 2017).

At the same time, correspondingly good practice was implemented in the United Kingdom through the Virtual Campus program, through which a secure online re-integration tool, which provided student-inmates with the opportunity to access learning materials and tools, which were useful for their future social reintegration (Tewksbury & Stengel, 2006). The evaluation of the program highlighted particularly positive results concerning both the inmates themselves, as well as the agencies and staff involved in their training process (Turley C. & Webster S., (February 2010), Implementation and Delivery of the Test Beds Virtual Campus Case Study, National Centre for Social Research).

Cornell University in the United States implements incarceration programs. Twelve such projects have been established in the United States. The government has already financed 350 training programs for convicts in 37 states (Garrison,

2017). However, from 1995 onwards, it was determined to curtail funding, thereby reducing the number of programs. According to research, forty-three per cent (43%) of inmates in US prison-education programs return to prison after their release (Chipere, 2017).

Sweden implements one of the most sophisticated inmate-education programs. There is a training centre with one or more teachers and a computer room in every prison; and the offenders have access to more than 130 educational disciplines. In addition, Internet access in Norway serves an educational function; and it facilitates family communication. However, prison officials strictly regulate the use of the Internet.

In Greece, the operation of Second-Chance Schools in the nation's jails is included in upgrading the correctional system, thereby allowing offenders to complete their primary education. However, this endeavour is restricted to an educational environment that reflects the unique characteristics and constraints of the jail regime, indicating potential hurdles to the educational process that hinder the operation of the Second-Chance Schools institution within prisons—an innovative endeavour to reconnect adult inmates with both the educational process and their re-admission into society (Gkintoni et al. 2022c).

By using a flexible program, Critical Pedagogy, and taking into account the social needs of the trainees, the Second-Chance Schools operating within the penitentiary framework, as well as the objectives of the Second-Chance Schools operating outside prisons, attempt to provide the detained adults with knowledge and skills, to contribute to the development of their critical thinking, and to the effort to transform the assumptions that cut them off from the social fabric, emphasising thereby the importance of reintegration.

Education, regardless of level and form, whether we are referring to adult education or life-long learning, must have immediacy and flexibility, in order to be able to respond to the stimuli of society and the impending needs of the market. Digital learning fills the gap created by the conditions mentioned above (Antonopoulou et al., 2019). It can provide the necessary tools to render the learning process more effective and to meet its goal (Gegenfurtner et al., 2020). E-learning is a learning process through modern technologies, such as computer applications and online platforms. Developing services in education and integrating different digital architecture approaches into a single framework is unique (Antonopoulou et al., 2020).

The cloud-infrastructure architecture is significantly more effective. It improves the response time of the digital ecosystem in situations where physical interaction is not feasible (e.g., a pandemic) (Antonopoulou et al., 2021a). The Coronavirus 2019 (COVID-19) was detected in China in December 2019; and it has now spread worldwide within a few months; and it was declared a pandemic by the World Health Organisation on 11th March 2020 (Bao, 2020).

sIn these special days caused by the Corona pandemic, there are limited opportunities to discover alternatives to online classes. Consequently, online classes are currently the most popular option. (Alam, 2020).

From the time of the pandemic (Covid-19) onwards, the educational process in Greece, in the places of detention, have faced serious problems, which are magnified due to the management policies applied by the respective administrations of the detention centres. A vital parameter of the above dysfunction is that prison education is not a continuous process; as it is interrupted after the end of the sentence. Education in detention centres is essential, in order to remain stable and continuous, as its interruption is a terrible setback for establishing the relationship between the school environment and that of the prisoner. The sharing of educational material and the assignment of tasks in the distance education of inmates, as has been implemented in other corresponding European programs (Conway, 2018), in order to cover the teaching of the subject to a certain extent; but it does not set the conditions for developing trusting relationships between instructors-students-inmates. The application of a horizontal solution proposed through creating a specially encrypted educational platform (reference our work-cite) seems to contribute to this purpose.

This encrypted platform can allow inmates to improve their knowledge, to acquire and practice ICT skills and generally develop skills that would help in their functional rehabilitation and gradual social reintegration (Antonopoulou et al., 2021a).

In addition, the correctional system provides few educational opportunities and options for adult and juvenile detainees, making the need for education and life-long learning an urgent priority. Moreover, innovative learning and teaching methods with inmates, through various techniques, such as gamification, promoting thereby cognitive and emotional parameters of the learners' personalities, such as the enhancement of their perception, attention, memory, and executive functions in general, as well as their emotional development (Gkintoni et al. 2021b). Therefore, it is recognised that the inmates have a greater need than any other educational group to engage in an educational policy that is aimed at developing and enhancing both their cognitive and psycho-emotional functionality for their eventual social reintegration, as well as strengthening the motivation for behavioural change in general.

This study aims to demonstrate the need for a secure distance learning innovative educational platform for Greek inmates, based on the country's Constitution and penal code, as well as the significance of education in the context of their sentence. Creating the specially designed platform can contribute substantially to the above wishes-requests of the student-inmates. The present research proposes a Game-based Learning application to learn basic digital skills and their further enhancement at a cognitive and social level. Furthermore, the application of game-based teaching methods stimulates the temper of the student-inmates, thereby creating pleasant feelings for them and improving their motivation and the desire to learn.

2. The Literature Review

The Significance of Innovation in Inmates' Education

The process of learning is a process that includes a multitude of methods and motivations. The overall goal of the learning process is to encourage learners to participate in lessons and to perform to the best of their ability. Some of these motivations include using information and communication technologies (ICTs) (Ojo & Adu, 2018; Chien, Liao, & Walters, 2015, Antonopoulou et al., 2021b). However, the social benefits of the essential goods of society, and among them that of education, are not always possible to offer with equal access to all citizens, for various reasons and limitations of physical, economic, and other kinds of advocacy.

An example of such inequality and the associated restrictions are detention centres, or prisons, as they are more commonly known. In other words, the possibility of continued studies by incarcerated students is often a difficult, if not impossible, prospect – precisely because of this limitation of their freedom. Therefore, restoring the facility that can be developed, as the result of a targeted effort through Information and Communication Technologies to supplement, repeat or substitute the learning and training opportunities of students serving their sentence in prisons, is a challenge and an issue of value. However, mainly, it is a response to the fact that the right to education is fundamental and should be given to everyone, without any restrictions (European Council, 1989).

In an ever-increasing digitising society, it is further deepening the idea that inmates cannot be excluded from society, especially when in a digital way inequality and barriers to access and the use of information through ICT exists. However, it can be bridged (Barreiro-Gen & Novo-Corti, 2015). Considering the importance of education in the development of the individual and the community, and considering that educational needs can be multiple, education in prison is a crucial way of facilitating the return of fundamental rights to inmates, such as economic and/or educational rights.

In the light of this logic, the encouragement of inmates to actively participate in development programs and the continuation of their studies aims at the development of the whole person.

In order to accomplish this, inmates should have immediate access to information and organised teaching, which would include practical elements (appropriate forms of training), which would enable the prisoner to complete his education in confinement.

According to research, education is critical to improving many long-term outcomes for inmates, their families, and communities—including reducing recidivism and increasing employability and earnings after release (Vera Institute of Justice, 2019). In the international community, as mentioned in the introduction, various innovative learning models, specifically designed for inmates, have been implemented (Torlone, Vryonides, 2016; Farley & Doyle, 2014). These projects, mostly e-Learning (California Community Colleges, 2018),

use Virtual Campus, a secure networked system that allows incarcerated people to access university education (Montenegro, 2021).

From the relative experience of these programs, there are three main conclusions: Firstly, the prison-education process should improve the educational opportunities of the inmates and, accordingly, their employment prospects (Parson & Langenback, 1993).

The digital divide between inmates and the wider community negatively impacts inmates' ability to reintegrate into society (Hopkins, 2015). Inmates' education, on the other hand, is one of the measures that could contribute multiple times daily; as it seems to reduce delinquent behaviour and violence in prison (Tan, 2015), but also the entire system of detention centres, reducing depression and anxiety and that of prison staff, who undertake part of this training (Finney et al., 2013). Secondly, in this way, re-offending is reduced, and this can render communities safer (Justice Data Lab Re-offending Analysis, 2013; Davis et al., 2013).

Much of this research on incarcerated education focuses on individual learning benefits (Pike, 2014). The general conclusion is that participation in higher levels of education provides cognitive solid and social learning, based on the restorative model (Risk-Need-Response); and it encourages inmates to express themselves without resorting to violence (Forster, 1990).

The Three Pillars in Inmates' Education

The international experience of educational policy within detention centres demonstrates the existence of three distinct approaches (pillars), depending on the weight each time given to the many reasons it serves and the orientation it adopts. Specifically, it has been discovered that throughout Europe, educational programs are provided within Detention Centres, which are either geared towards the completion of the individual's personality and their empowerment through Adult Education, so that they can respond to a variety of roles in modern society, or to deal with the delinquent behaviour, or solely to his professional training and expertise (Costelloe & Warner, 2014).

In particular, the first approach is imposed by the directive of the Council of Europe on Education in Prisons (Council of Europe, 1990), which highlights the global development of the individual's personality through Adult Education, taking into consideration the social, economic and cultural environment in which he lives. In this view, Adult Education promotes creativity and critical thinking, which contribute to a more significant and lasting change in the individual's awareness, his view of the world, and in the path that he follows in his life. Also, the adoption and promotion of the humanitarian visa underlines the need to implement educational activities within the detention facilities, so that the inmates can positively redefine their life attitudes, encouraging them to develop at a personal and social level (Coyle, 2009). The application of this view to the modern reality of prisons is by providing secondary education programs oriented to the needs of the target group, i.e., adult inmates.

According to the second approach, the incarcerated person is perceived as a "delinquent" and a criminal, so the educational programs that are provided are oriented towards dealing with delinquent behaviour and suppressing the generative causes of crime, emphasising the moral development of the individual by managing his cognitive deficits (Munoz, 2009). Such programs were implemented in Canada in the early 90s and later in other European countries, focusing on developing cognitive skills and managing anger and addiction. A variation of this view is the focus of educational practices regarding the context of incarceration and the dysfunctional situations it creates.

Finally, in the third approach, the educational practice focuses on vocational education and training, as the consideration of vocational rehabilitation prevails with education contributing to finding work after release, aiming to reintegrate the released inmate, and avoiding his diversion into crime. Indeed, this view from some scholars is purely "utilitarian" (Munoz, 2009); as it links learning – through the exclusivity of training – to work, thereby limiting the broader horizon of the learning process (Ebner, 2019). The criticism that this model is subject to is based on targeting the universal development of the personality of the inmates, which is achieved through the provision for the provision of formal and non-formal education, programs with an emphasis on improving literacy, basic education, vocational training, creative employment, religious and cultural activities, sporting events, socio-cognitive education, higher education and the extensive use of libraries.

It is clear from the previous description of the three approaches that, in order to build a beneficial learning environment for adult inmates, prison education should envisage and provide an expanded curriculum aimed at the multi-facetted development of the individual's personality, and not only on the reintegration of the "criminal", or on his professional rehabilitation; since Adult Education aims at the development of various knowledge and skills, as well as at the transformation of assumptions and attitudes.

Inmate participation in Second-Chance Schools is facilitated by both the institutional framework and the enhancement of incentives relating to personal growth, the improvement of professional abilities, the escape from boredom, and the liberation from the mundane. Many incarcerated individuals view their involvement in Second-Chance Schools as a fresh opportunity for education and learning. According to research, the prison system itself is the key motivator for offenders to participate in the educational process; and, consequently, also of Second-Chance Schools. Monitoring educational activities is encouraged by the emancipation from daily oppression, the enhancement of professional abilities, and acceptance by the family. The motivation of detainees to participate in educational programs is also attributed to the existence of reasons connected to preparation for life after prison, social variables that interact with the prison environment, and the acquisition of information and skills.

Neuroplasticity in Inmates' Education

One of the most recent advances in neuroscience that can be used in the educational process and learning is the discovery that the human brain is extremely flexible, i.e., it can be altered by experience, a process known as experience-dependent plasticity that happens throughout life. In addition, throughout adolescence, and beyond, major developmental changes in brain structure and function occur; and these changes are impacted by the environmental input. Specifically, the hypothesis of brain neuroplasticity can be used in prisoners' education, as has been demonstrated by research undertaken with other population groups.

Exemplifying this is a study of London taxi drivers that studied the effect of extensive training on brain structure. The training consisted of learning how to navigate the city. This study found that educating taxi drivers' navigational abilities affected their hippocampi, a comparable region engaged in spatial navigation. There was a correlation between the amount of training and the extent of the observed morphological changes in the brain. There were notable individual differences in the extent to which training can alter brain structure, indicating that plasticity is not unlimited. Special education is another area in which the effects of education on the brain have been established, as seen by studies examining the effects of particular remedial interventions on the brain structure and function of children with atypical development.

Normalisation, in which the brain function becomes increasingly comparable to that of a typically developing control group, and compensation, in which activity patterns in regions other than those described in typically developing youngsters, were demonstrated by these studies. These patterns of how persons, with atypical learning, compensate for their difficulties, are particularly significant in education; because they may provide new techniques for teaching specific compensatory strategies, the effects of which should be investigated through educational research.

Social Function and Gamification in Distance Learning

Even though gamification is frequently connected with expertise, competence, flow, and goal commitment, it is self-evident that social components also play an important role. In the light of this, we aimed to investigate empirically how social variables, such as social influence, recognition, and reciprocal rewards, affect attitudes and usage intentions in gamification services (Gkintoni et al., 2021a). Therefore, gamification in the form of points and levels, facilitates this social process within the group. Therefore, it is possible that even a basic "pontification" could become "meaningful", when shared among a group of like-minded individuals working towards the same goals.

Distance Learning is well-suited for gaming applications, due to its intrinsic and intangible characteristics, as well as the nature of gaming. Traditional education is less aesthetically appealing and engaging than electronic learning. Thus, gamification can be used to increase motivation and compensate for certain fundamental pedagogical flaws inherent in e-learning systems, such as the lack of emotional connection between teacher and student in conventional education.

This emotion is aided in its development and expansion by gamification. Thus, the incorporation of gaming into remote education has several evident advantages.

It improves students' commitment, motivation, achievement, and memory of the target, as well as their individual learning and critical thinking abilities. It can form collaborative teams and help them achieve greater success through competition. Additionally, it promotes digital literacy and improves academic standards.

Socio-Cognitive Awareness and Gamification in Distance Education

A fundamental component of inmates' behaviour, in which education can be decisive, is strengthening their social vigilance. Socio-Cognitive awareness seeks to correct problematic behaviours, based on entrenched negative patterns of behaviour learned from early childhood and adolescence. The purpose of education in detention centres is to develop cognitive and social skills, such as insight, in order to practise new skills during training (Gkintoni et al. 2022a), and to integrate them into all the aspects of their lives through group meetings that take place in detention centres, skills that can, or may also be useful during the phase of their social reintegration.

Insight, as part of social vigilance, is the inmate's skill to have a clear or deep understanding of a situation through self-awareness, which is a practice that, when engaged, literally raises one's consciousness. Three fundamental approaches are used to develop self-awareness in social vigilance. Firstly, learning these skills is linked to changes in behaviour, from an inmate's impulsive reaction to various social situations to making conscious choices. This parameter can be linked to the motivation for the manifestation of delinquent behaviour, or the committing of a crime. These three practices are described below.

Conscious awareness, Emotional Intelligence, Critical Thinking, and Awakening skills that are components of socio-cognitive awareness, are skills that can be improved through innovative training methods, such as the application of gamification through experiential scenarios that strengthen these parameters of socio-cognitive awareness. In addition, the application of innovative digital teaching methods through gamification to student-inmates contributes to the development of insight through increased awareness of the connection between the mental, emotional and physical aspects of one's being, using emotional intelligence and critical thinking and learning tools to process difficult emotions effectively (Gkintoni et al. 2022b).

Through these, each student-inmate has the opportunity to rediscover his most authentic self. At the same time, the critical thinking that is strengthened through the educational scenarios of gamification, includes self-reflection for rational evaluation and interpretation of situations and circumstances. A student-inmate, as a critical thinker, now strives to improve his reasoning ability, in order to recognise that he will occasionally make mistakes, due to the human irrationality of prejudice and uncritically accepted social norms and self-interest. Through the

educational scenarios of gamification, the student-prisoner, as a Cretan thinker, is now taught to learn that often, what causes him anger, disturbance or depression is not so much about the world around him, but how he sees and interprets these circumstances.

The above is connected to the well-known saying of the philosopher aide, who mentions that "the interpretation of events or circumstances is responsible for people's problems and not the events themselves", which is an important parameter and basis for the principle of a cognitive behavioural intervention that determines the change of behaviour (Herbert et al., 2013). An additional parameter that is strengthened through the application of educational gamification scenarios is emotional intelligence, which includes an adequate understanding of oneself and others, a good relationship with people, and the adaptation and effective treatment of situations and individuals (citation).

Given the importance of e-Learning education for Greek inmates and socially isolated individuals, this study aims to describe the process by using a flowchart (Figure 1). Considering what has been reported thus far, and the current body of literature, the following research questions can be formulated:

- [RQ1] Is social adequacy a predictor of inmates' self-control?
- [RQ2] Is emotional adequacy a predictor of inmates' self-control?
- [RQ3] Are leadership and digital skills predictors of inmates' self-control?
- [RQ4] Can inmates' socio-cognitive awareness be facilitated by using gamification techniques via an innovative educational platform?
- [RQ5] What role does gamification play in improving motivation, self-control, and social functioning?
- [RQ6] What effect does gamification have on cognition?

3. The Methods

The Research Design

Based on the country's constitution and penitentiary code, the objective of the first part of this study is to implement a modern, asynchronous, and encrypted distance-education platform for Greek inmates. In addition, the second phase of the present study intends to give information regarding the education of inmates through modern remote-learning techniques. Particularly, an attempt is made to determine whether educational techniques that incorporate fun, motivate convicts to learn and familiarise themselves through life-long learning. The primary objective (Phase A) of the study is to present an innovative encrypted educational platform with the application of gamification techniques, to a sample of inmates, with the intention of strengthening their socio-cognitive awareness.

Furthermore, a secondary aim of the study (Phase B) is to emphasise the significance of life-long education for inmates, with socio-cognitive awareness facilitated by using gamification, during the time they are serving their sentence. The research approach is depicted in the image below (Figure 1).

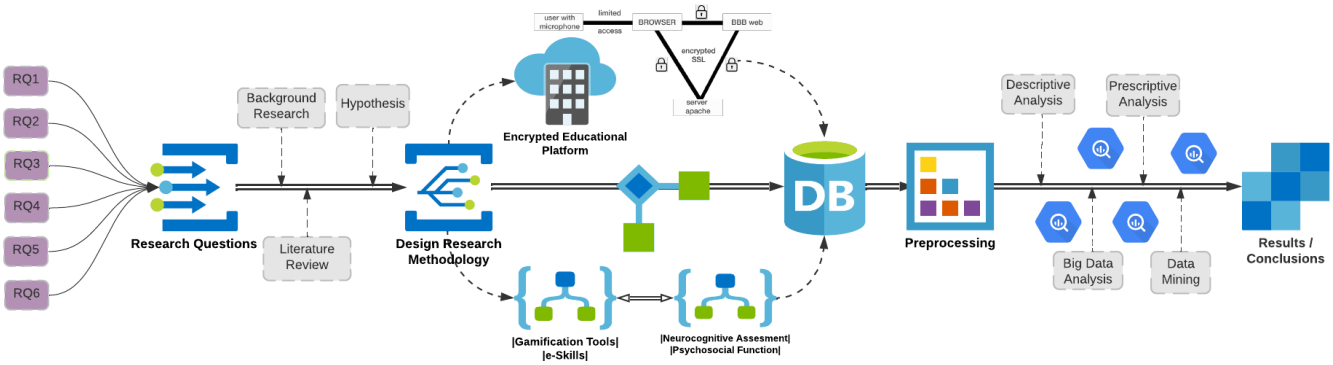

Figure 1. Flowchart of Research Methodology

3.1. Phase A

Platform-Technical Specifications

Asynchronous Training of Proposed Platforms by web-conferencing tools

The supplied system is based on the Moodle open-source code, which is the product of a highly successful effort to develop open-source software that is utilised internationally for real-time course delivery by universities, colleges, enterprises, organisations, and institutions. The third version of the GNU General Public Licence governs the Moodle platform. There will be no limit to the number of registered users of the platform and/or its licences, as a result of the system's licensing. In addition, the licences include lifetime access to the software. Official figures reveal that Moodle has over 72,000 (registered) facilities in 230 countries; and it delivers instruction through over 11.2 million courses to over 96 million users, thereby demonstrating the completeness of the intended system.

Apparently, 530 million queries have been developed on Moodle systems across the globe, and about 200 million posts have been composed in educational communities inside the systems. (Source: http://stats.moodle.net/).

Moodle stands for Modular Object-Oriented Dynamic Learning Environment; and it is a software package for distant learning. Moodle is written in PHP; and it is compatible with any machine that can run PHP, as well as many database types. It is highlighted that the proposed method has apparent benefits; and it meets all the declaration's conditions. In addition, the system's flexible design and modular, open architecture permit future extensions and replacements, integrations, upgrades, or changes of individual sub-system components, without requiring reliance on a single item of equipment, or software provider.

Synchronous Training of Proposed Platform

The Big-Blue-Button program is suggested to suit these requirements. Big-Blue-Button is a video-conferencing solution that was created to facilitate virtual meetings between geographically distant people. However, the application's ongoing development has enabled the addition of features that make it a great tool for distance learning. Big-Blue-Button enables the development of "virtual" classrooms, in which geographically distributed users can conduct online

meetings for training, information exchange, question submission, and resolution, etc.

In addition, because of the system's ability to record each session/lesson, a series of lecture films may be readily separated into sections for the convenience of the learner (Giannoulis et al., 2022). The trainees would have direct, any-time access, to the "recorded" lectures.

This sophisticated e-learning system is fully compatible with the asynchronous e-learning system, thereby ensuring:

- The possibility of organising, scheduling, and integrating current e-learning sessions into any educational program, as well as the option of adopting blended-learning programs. This may include asynchronous e-learning courses, the scheduling of modern e-learning sessions (virtual classes), and any additional study materials, exercises, case studies, etc.
-
- The usage of a completely integrated system by trainees, who enter with a unique password and have access to all the services, functions, activities, and data connected to their education, from a single educational environment, thereby allowing them to participate in all asynchronous and contemporary e-learning processes.

Intolerability between Asynchronous – Synchronous Training

Planning an instructional activity with Big-Blue-Button is a function that can be completed quickly. In addition, the program has no prerequisites (such as software installation, set-up of previously installed apps, or user PC intervention). This practically means that the system can be used in cases of "strictly" structured educational programs (as one of the educational activities provided within the structure of a program), but also for conducting "ad-hoc" sessions, whenever an immediate "meeting" for education, information, co-operation, etc. is required, "inviting" to the meeting even users who have not previously used similar systems.

Practically, participants in a session using Big-Blue-Button have access to modern real-time communication and a suite of tools that permit the presentation and display of virtually any type of instructional content. Using a typical microphone-camera, for instance, participants in a video conference can view and hear each other, as well as exchange text messages. It is mentioned that there are no special-equipment requirements, and that the system has been tested and operated with different types of internal-external microphones, integrated or not with the camera, speakers, etc.

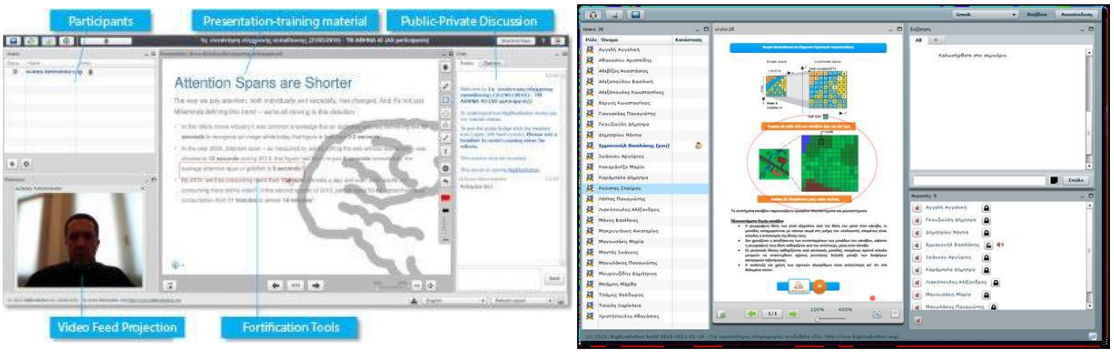

Figure 2. Interactivity between Systems

During the sessions, some participants assume the role of speaker; and they can have the "step" of the meeting and address all the other participants, as well as display on the virtual "board" accompanying educational material of any kind, or share the operation of their computer with the other participants (desk-top sharing). In any meeting, and particularly when there are many sessions, one of the participants is designated as the moderator of the conference call; and s/he assists the speaker(s). The manager can co-ordinate the meeting (Figure 2), thereby assisting the participants, and granting them the floor upon request, etc.

Due to the system's capacity to record each session/lesson, a series of videos with classified "recorded" lectures may be simply constructed for the learners' convenience. After the class, the trainees would have immediate access to the "recorded" lectures; and they would be able to refer to them at any time (Figure 2). Due to the GDPR Law 2018/1725, all the participants must consent to the recording, in order for this feature to be used. Online browsers save web browsing data and history for the users' convenience, such as instant website recommendations, or faster access to previously visited websites (Mahaju & Atkinson, 2017). Each computer, whose access we intend to restrict, must have a local administrative account (which usually exists or should exist on shared computers). It is assumed that Windows 10 is utilised as the operating system.

Our objective is to define every computer. This firewall rule employs numerous, non-overlapping sequences of IP addresses, in order to cover the entirety of the internal network's IP address range. For instance, imagine we wish to restrict Mozilla Firefox's Internet access to the local server. This approach can be used in any application that we wish to restrict.

In addition, as shown in Figure 3, an Apache Server is deployed to support the Windows server operations and to provide the TCP/IP communication demands of the installed components with the connected learners' PCs. The server's operating system is Windows 10 64-bit. All apps within the "triangle" reside on the same server, which is protected by the previously described firewall configuration. Due to the simplicity of our program, no virtual machines were constructed, as just two applications (supported by the Apache Server connection

features) operate concurrently: a local (to the server) Web browser and the BBB (Big-Blue-Button – see https://bigbluebutton.org) virtual classroom platform.

In addition, no cloud architecture or services were established (locally); because our application did not require them. Lastly, no external cloud services were utilised, for the same reason, in addition to the stringent security requirements (mostly limited or restricted, connectivity with the Internet and the World-Wide Web outside of the protected prison's local network). Concerning security, the enabled modes' module of the Apache Server provides an interface to the OpenSSL library, in order for strong encryption, based on the Secure-Sockets Layer and Transport-Layer Security (SSL and TLS) protocols. In the classrooms of the institution, the students are connected via Ethernet ports; and computers have been installed in the classrooms for greater security.

There are no permitted WiFi connections to the local WiFi router (the router is configured to block any request for connection, beyond specific devices, if necessary, with specific MAC addresses). The Ethernet ports only support the computers that are already connected (through safe listing), and no other computer can be attached to them. Regarding the BBB platform, it can be installed on the same Windows 10 server (although the native method is to use Ubuntu Linux if Windows 10 is not required; however, it is in our case).

Installing the VMWare player is followed by launching the Big-Blue-Button VM and red5 add-on for live streaming support. This enables screen-sharing as well. The Big-Blue-Button client module can be installed on classroom computers, so that viewers can access and observe a shared presenter's desktop. Using the Apache Server's functionalities, all communications are fully protected by using the TLS/SSL (secure) encryption.

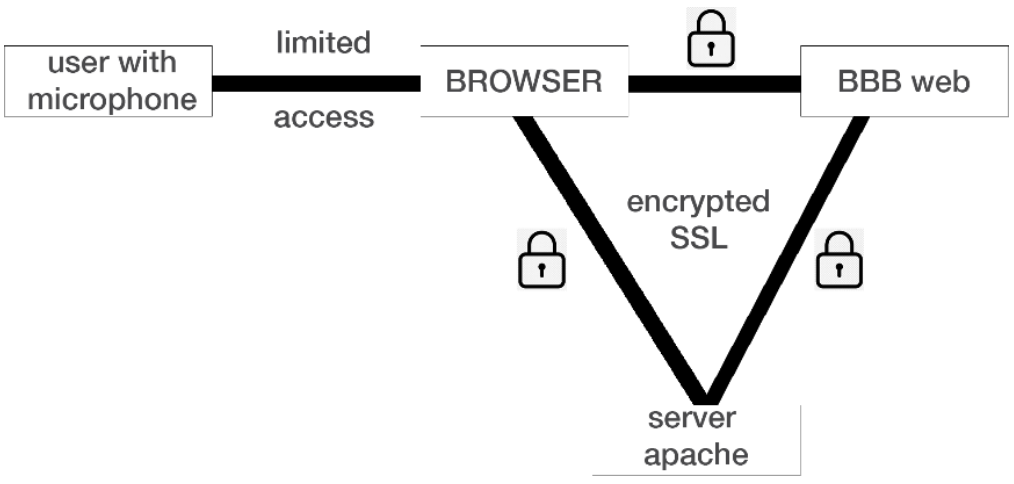

Figure 3. Interactivity between Systems

3.2. Phase B

Materials and Methods

Description of the Psychometric Scale

The Psycho-social Adaptation Scale is an assessment instrument designed to evaluate skills and deficits in social, emotional, and school adaptation, as well as intrapersonal and interpersonal adjustment. Also, it is an instrument that evaluates the multi-dimensional structure of an adult's psycho-social adjustment by concentrating on deficiencies, while also including information from the instructor. The expert can use the scale to examine the psycho-social features linked with learning impairments, and to discover aspects of the psycho-social profile of an adult.

The Participants

The research was conducted in Western Greek correctional facilities with a sample of sixty inmates, by using the proposed training platform during the Covid-19 pandemic. 60% (N = 36) of the sample consisted of men, and 40% (N = 24) consisted of women. The mean age of the student sample was 25.5 years (SD: 0.8 years).

The Data Collection

The Psycho-social Adaptation Scale, a self-reporting measure, was used to assess their cognitive function and psycho-social function in two time periods: before and after the implementation of gamified teaching approaches. The questionnaire contains a list of recommendations describing different aspects of their behaviour. Each inmate was instructed to carefully read each scale sentence and circle the number corresponding to his or her level of identification with that behaviour.

The inmates' responses were then rated by using the Likert scale's five-point scale (1 - 2 - 3 - 4 - 5) as follows: 1 = if this sentence does not apply, it is completely inappropriate for you; 2 = if it fits you somewhat; 3 = if it fits you moderately; 4 = if it fits you rather well; and 5 = if it fits you quite well. Below are detailed descriptions of the scale's dimensions:

- Social Adequacy
- Educational Adequacy
- Emotional Adequacy
- Leadership Skills – Digital Skills
- Perception of the ability to learn
- Self-control
- Motivation

The assessment is comparable to measurements frequently applied in a number of nations. Typically, individual scales are used to evaluate social skills, executive functions and behaviours, emotional adequacy, motivation, and self-perception. An additional aim of the study was to determine whether the playfulness of distance modern and asynchronous learning, as well as the use of educational digital and play-centred learning objects, increases the interest and motivation of particular groups of the population, such as inmates, to engage in the educational process.

Gamification is anticipated to increase learners' engagement and interaction with one another, the instructor, the game, and with the instructional materials, resulting in the achievement of critical learning objectives, such as cognitive-object depth (the acquisition of essential/advanced information, familiarity with diverse perspectives/interpretations, and application of information in every-day life) and the identification of cognitive and emotional parameters.

3. Results and Discussion

This study confirmed the use of an awareness program applied to instructional practices for the improvement of socio-emotional functions and, over time, the improvement of cognitive performance through gamification. Undoubtedly, the Covid-19 outbreak is a driving force in the formation of new working and educational conditions in a range of environments of social integration. Digital on-line education tends to entirely replace traditional education. For this purpose, the adoption of novel distance-learning strategies that foster learners' motivation, psycho-social, and cognitive growth is seen as an absolute requirement.

Gamification is a reward-system technique that has been implemented in a range of fields, including business, healthcare, and education. However, a paradigm shift has happened in the definition of gamification, as indicated by the literature review. Before introducing game components into the system and its key users, the learners' thorough preparation is essential, in order to bring value to the gamification process. The fact that gamification may be utilised in both traditional and digital-learning contexts is one of its key advantages.

With meticulous planning and incorporation of gamification into teaching and learning, such as a user-centred top-down system approach, elements of fun that create a fun loop, and adequately supported challenges, it is hoped that a meaningful gamification system could be created, thereby enhancing students' cognitive abilities.

As far as the results of the study variables' descriptive indices were investigated and assessed, in order to describe the demographic features, the major location and dispersion metrics, as well as the frequencies and relative frequencies, were utilised. Cronbach's alpha reliability index was computed, in order to determine the reliability of the students' responses (before and after the session) to the individual phrases that comprise the dimensions. Factor analysis was conducted, in order to determine the importance (i.e., the proportion of variance explained) of each questionnaire factor in the composition of the individual dimensions and the sub-scales. For the sub-scale correlation (using standard variables), the Pearson-correlation coefficient was determined.

The t-test was used to compare the means of two independent samples, in order to examine the relationship between dimensions and student-inmates' demographics and gender. Multiple-linear regression and machine-learning algorithms (Antonopoulou et al, 2022) were used to predict any possible behavioural difficulties, based on self-perception, emotional and social adequacy simultaneously. The dependent variables of the model were "Self-control" and

"Motivation," whereas the independent variables (potential-predictor variables) were "Self-perception", "Emotional adequacy", "Social adequacy", "Educational adequacy", "Leadership skills" – "Digital Skills ", and the "Perception "of the ability to learn.

By using the paired t-test, the variation in scale dimensions, before and after the use of the play methods, was assessed. These values were obtained by applying regression models to the dimensions, in order to determine the non-response of some student-inmates. The reported p-values were derived from bilateral controls. The results with P-values less than 0.05, were regarded as statistically significant. The statistical analysis was performed by utilizing SPSS software (SPSS Inc., 2003, Chicago, USA).

The findings of applying the multiple-linear-regression model to predict "Self-control" by "social competence," "emotional competence," and "leadership skills-digital skills" are presented in Table 1. It appears that "Leadership Skills – Digital Skills" is a significant predictor of "self-control" (p=0.019) [RQ3]. Similarly, the "social adequacy" component appears to predict the "self-control" dimension (p=0.016) [RQ1]. In addition, the "emotional-adequacy" dimension appears to be a significant predictor of the "self-control" dimension (p=0.018) [RQ2].

In contrast, it did not appear that the other aspects were statistically significant in predicting self-monitoring.

Table 1. Multiple-Linear Regression model with dependent variable dimension "Self-control"

Independent variables	**β**	**95% CI**	**p-value**
Social Adequacy	-0,5	[-0,7] – [-0,1]	0,016*
Emotional Adequacy	-0,4	[-0,6] - [-0,5]	0,018*
Leadership Skills – Digital Skills	-0,5	[-0,9] – [-0,1]	0,019*

β: coefficient of partial dependence
95% CI: 95% Confidence Interval for β
** Statistically significant result*

Gamification Pre/Post Evaluation
Table 2 displays the findings of an enquiry into the difference between the scale's dimensions before and after an instructional procedure employing playful methods. Regarding the dimensions, it shows that there is a statistically significant difference ($p<0.05$) in the average value of the dimension "Leadership Abilities - Digital Skills" of "Emotional Adequacy" and "Social Adequacy" before and after the use of games. More specifically, the average score of the above dimensions is on average higher after the intervention.

Therefore, the highest score after applying the gamification methods highlights the success of the intervention, regarding the skills Leadership, the Skills-Digital

Skills, Emotional and Social Adequacy. The parameters mentioned above represent the degree of socio-cognitive awareness of the inmates, whence a significant improvement and expansion of socio-cognitive function was observed [RQ4]. Also, the intervention seems to have contributed to the average increase of the scores on the dimensions "Motivation", "Educational Adequacy", "Self-control," and "Perception of Learning Ability". However, these differences were not statistically significant.

Higher levels of social and emotional competence result in greater Self-Control. Gender does not appear to play a significant influence in the psychological adjustment of student-inmates. As indicated in Table 2, the educational intervention considerably improved the social and emotional adequacy and digital/leadership abilities of student-inmates [RQ5]. In the present study, novel teaching approaches incorporating the use of play in distant education, serve as a motivational drive for student-inmates, thereby boosting their emotional and social competence skills. Moreover, via the use of new learning methodologies, personal qualities, such as leadership and digital literacy, are improved. In addition, other variables, such as motivation, educational competence, self-control, and the perception of learning ability, appear also to be improved [RQ6].

As a function in education, gamification can be important for the population of inmates; and it can facilitate their subsequent social reintegration, by providing them with essential resources for their continued personal and professional development and their psycho-emotional development, thereby providing them with a second opportunity.

Table 2. Dimensional-correlation results, before and after the application of gamification

Dimensions	**Intervention**		**Mean Difference**	**p-value**
	Pre (n=60)	**Post (n=60)**		
Leadership Skills - Digital Skills	50,0 (10,0)	52,4 (9,2)	-2,4	0,042*
Emotional Adequacy	50,1 (10,0)	50,1 (9,7)	0,0	0,922
Perception of the ability to learn	49,9 (10,0)	51,9 (10,0)	-2	0,154
Motivation	49,9 (10,0)	51,1 (9,3)	-1,1	0,474
Educational Adequacy	50,2 (9,9)	51,4 (9,2)	-1,3	0,008*
Self-control	50 (10,1)	50,1 (10,0)	-0,1	0,905

SD: Standard Deviation
[1]*Mean Difference = Score Pre-Score Post*
[2]*t-test in pairs*
* *Statistically significant result*

According to the study of the research data, offenders participate in training programs to obtain professional upgrades and "arm" themselves with formal and substantive qualifications, in order to plan their futures and to prepare for their release from jail. As a reason for participation, they note that their education gives an escape from the routine and stress of prison; they wish to develop hobbies and fill their spare time. In addition, during the educational process, the relationship between the inmates and the trainers functions as a conduit to the "outside world."

After their fundamental requirements are met, participation in educational activities becomes a vital part of their development, self-determination, and the pursuit of interests; they seek to comprehend what they did not grasp at an earlier age. In addition, communication is essential for engaging incarcerated individuals in educational programs. Firstly, they need communication with professors and instructors, who represent the "outside world"; and secondly, they desire internal contact with themselves, away from the cell area, in a different environment, such as laboratories or classrooms. Teaching would create internal connections between how people express their emotions and what they feel.

To sum up, it is crucial to mention that the results of this study suggest that gamification may be an effective method for enhancing the cognitive performance of inmates, and thereby creating a meaningful learning experience.

At this point, it is worth mentioning that, before conducting the primary research, a preliminary survey was conducted among the teachers of second-chance feedback by administering a self-reporting questionnaire to 7 of the 13 Second-Chance Schools in the country. As a result, 85% of the respondents answered that student prisoners reported that their motivation for attending second-chance schools was to acquire and improve their basic cognitive and social skills. In addition, the interviewed teachers mentioned student inmates' desire for further education and for the acquisition of essential IT and communication-technological skills.

The necessity of using ICTs to allow incarcerated students access to learning and academic information is evident, given their incarceration for the duration of any sentence. Inmates are generally not allowed to access e-learning technologies, due to prison restrictions that prohibit inmates from accessing the internet. Their training is usually in the form of books and notes. Although this method allows access to course material, it does not develop modern digital skills in incarcerated students, when these are becoming increasingly necessary in today's world.

Utilising several cognitive tasks and standardised neuro-psychological instruments in conjunction with e-games and other psychometric scales for social functions in various educational environments at all levels of education, future research should demonstrate the value of gamification in cognition and psycho-social development in a larger sample of inmates.

The present study has confirmed the use of an educational intervention applied to learning settings for the development of psycho-social functions and, at a

macroscopic level, the improvement of neuro-cognition through gamification. Undoubtedly, the Covid-19 epidemic is a driving force in the formation of new working and educational conditions in a variety of professional settings. Digital-distant education tends to entirely replace traditional education. For this reason, the adoption of novel distance learning strategies that foster students' motivation, psycho-social skills, and cognitive growth is seen as an essential component.

In addition, the recent study has demonstrated the significance of gamification in the cognitive and social growth of inmates participating in distance education. The research technique, as well as the conclusions, appear to cover the research issues that were addressed. Gamification technology in distance-education appears to boost the interest and motivation of incarcerated students.

Ultimately, the gamification-based educational intervention has enhanced socio-cognitive awareness and dramatically enhanced three characteristics, namely social adequacy, emotional adequacy, and leadership, as well as digital skills. Incorporating gamified techniques into distant, modern, and asynchronous education, appears to boost learners' motivation.

4. Conclusion

The philosophy of digital education for incarcerated students recognises the inmate as an adult entitled to participate in fundamental academic, vocational, health, cultural, and socio-cognitive education, and not just to a limited availability of programs. Access to academics, and not just learning, must be modernised, in order to meet the critical challenges faced by inmates and their support services, particularly considering the current economic crisis. Potentially reshaping the appropriate technological tools and modifying the educational models in the prison system would alter the role of the educator, organisational class issues, teaching and learning processes, and interactive mechanisms. It permits the educators and student-inmates to improve learning and teaching practices through the use of ICT.

They may encounter numerous obstacles and personal insecurities. However, widespread access to the internet, the use of social media, and the capacity to manage vast amounts of information and communicate directly with everyone in the world has a positive effect on coping with daily life and learning within the prison system.

The European nations are interested in providing high-quality education in prisons; and they recognise the significance of education in reducing recidivism and preparing inmates for a better life upon release. This broader effort is motivated by the belief that, if properly structured, education improves a person's employment prospects and contributes to their long-term social integration. Recent economic developments have compelled Member States to develop prison education with greater ingenuity. For prisons to keep pace with society and the demand for social justice, reducing social exclusion and enhancing labour-market skills, digital and technological progress, leads to the development of digital applications pertaining to prisons.

All the parameters lead to the conclusion that all European nations, including Greece, will soon be forced to make difficult decisions in the light of the economic constraints and the corresponding social requirements for prisons, and the education of their inmates.

For the duration of their sentences, incarcerated students must have access to academic and learning content via ICT. Most of the time, inmates do not have access to digital educational technologies, due to jail regulations prohibiting Internet access. Despite the limited number of available programs, the concept of digital education for inmate students recognises the offender as an adult, who is permitted to participate in primary academic, vocational, health, and socio-cognitive education (focusing only on basic literacy programs). Access to academic and non-academic learning must be expanded, in order to address the significant challenges facing inmates and their support services, particularly considering the current economic climate.

The educator's role, organisational class issues, teaching and learning strategies, and interaction mechanisms would be altered if the appropriate technical instruments and teaching models are potentially modified during the disciplinary process.

Limitation and Recommendations

Other studies may use additional research instruments, such as surveys, questionnaires, focus groups, and qualitative methods, such us individual interviews, in order to enhance learning materials and obtain a better understanding of the study's findings.

Authors' Contributions

H.A., A.G., L.T. & C.H. contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript. All the authors have read and agreed to the published version of the manuscript.

Data-Availability Statement

The data presented in this study are available on request from the corresponding author.

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Ethical Approval

Participants with prior approval from their parents, gave their written consent to use their anonymous data for statistical purposes.

Conflicts of Interest

The authors declare that there is no conflict of interests, regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed

consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been fully observed by the authors.

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