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PEDAGOGICAL INNOVATIONS IN PUBLIC HEALTH LAW: AN EXHAUSTIVE REVIEW OF SIMULATION, GAMIFICATION, AND LEGAL EPIDEMIOLOGY

INOVAÇÕES PEDAGÓGICAS NO DIREITO DA SAÚDE PÚBLICA: UMA REVISÃO EXAUSTIVA SOBRE SIMULAÇÃO, GAMIFICAÇÃO E EPIDEMIOLOGIA JURÍDICA

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Abstract
In order to better reflect contemporary professional practice, this study examines how public health law education has changed from its traditional reliance on case-based instruction to experiential, simulation-based, and multidisciplinary approaches. The Langdellian paradigm enhances analytical thinking, but it does not adequately prepare lawyers to handle complex problems like pandemics, cross-sector coordination, regulatory governance, and health disparities. The study is based on the constructivist and situated learning theories and demonstrates that the use of serious games, simulations, tabletop, legal epidemiology tools, and virtual reality enhances judgment, ethical awareness, teamwork, and systems thinking. Students are exposed to limitations, authority structures, and uncertainties that are often absent from typical classroom environments through experiential learning. The paper addresses risks like trivialization, design bias, unequal access,

Resumo
Com o objetivo de refletir melhor a prática profissional contemporânea, este estudo examina como o ensino do direito da saúde pública evoluiu, passando de uma abordagem tradicional baseada em casos para abordagens experienciais, baseadas em simulações e multidisciplinares. O paradigma langdelliano estimula o pensamento analítico, mas não prepara adequadamente os advogados para lidar com problemas complexos, como pandemias, coordenação intersetorial, governança regulatória e disparidades na saúde. O estudo baseia-se nas teorias da aprendizagem construtivista e situada e demonstra que o uso de jogos sérios, simulações, exercícios de mesa, ferramentas de epidemiologia jurídica e realidade virtual aprimora o julgamento, a consciência ética, o trabalho em equipe e o pensamento sistêmico. Os alunos são expostos a limitações, estruturas de autoridade e incertezas que muitas vezes

and digital divides in order to ensure that graduates are capable, moral, and practically successful in promoting universal health and professional responsibility across various legal and public health systems, both now and in the future. Additionally, it promotes equity-centered implementation, rigorous assessment, and carefully designed curricula.

Keywords: Public Health Law. Simulation Based Learning. Gamification. Legal Education. Experiential Pedagogy.

estão ausentes em ambientes de sala de aula típicos por meio da aprendizagem experiencial. O artigo aborda riscos como trivialização, viés de design, acesso desigual e exclusão digital, a fim de garantir que os graduados sejam capazes, éticos e bem-sucedidos na prática na promoção da saúde universal e da responsabilidade profissional em diversos sistemas jurídicos e de saúde pública, tanto no presente quanto no futuro. Além disso, promove a implementação centrada na equidade, a avaliação rigorosa e currículos cuidadosamente elaborados.

Palavras-chave: *Direito da Saúde Pública. Aprendizagem Baseada em Simulação. Gamificação. Educação Jurídica. Pedagogia Experiencial.*

1 INTRODUCTION

The modern scene of legal education, that is, the critical and fast-changing field of legal education on the topic of public health, is going through a phase of fundamental structural and pedagogical revolution. The case method of teaching law has dominated the teaching of law at the United States and most of the common law world since Christopher Columbus Langdell invented the technique in the 1870s at Harvard Law School [1]. This approach that views law as a science based upon the inductive study of the decision-making of appellate courts has been effective in inculcating generations of lawyers in the art of being a doctrinal analyst and the ability to think like a lawyer [2]. The adequacy of this traditional model has however been put under serious question as the challenges of the modern administrative state have grown, and as the character of the threats to public health has ceased to be localized sanitation problems, and has instead taken a global pandemic and disease management [3-1].

The legal workforce required in the 21st century, characterized by cross-border health crises, such as the COVID-19 pandemic, the opioid crisis, and increasing prevalence of non-communicable diseases, necessitates a legal workforce that is not only knowledgeable about legal cases but also proficient in interdisciplinary teamwork, crisis management, regulatory negotiation, and evidence analysis [4]. The nature of the public health law is transdisciplinary, i.e. its functioning is based on the junction of the

constitutional power, the administrative law, the epidemiological science, and the political approach. The conventional classroom, which is centered on analyzing the past judicial cases in a static manner, is slowly becoming a perceived inadequate setting to simulate the dynamic, pressurized, and generally ambiguous context that the public health attorney is required to operate [5].

To address these gaps, an ecological variety of pedagogical innovations has come up, which has based on constructivism, situated learning, and serious play theories. These technologies include high-fidelity digital simulations and serious games simulating international treaty negotiations [6] to the so-called analogue tabletop exercises training emergency preparedness [7], and state-of-the-art computational aids such as MonQcle that educate a legal epidemiology as a quantitative science [8]. This report gives a comprehensive, detailed study of these developments. It covers the theory behind the move to experiential learning, outlines the mechanics and learning outcomes of the leading simulation tools, discusses the ethical and practical issues of gamification such as trivialization risk and the digital divide, and suggests that the rigorous frameworks to evaluate student competency in this new educational paradigm.

2 THEORETICAL FRAMEWORKS AND THE CRITIQUE OF TRADITION

In order to immerse into the need and effects of simulations and gamification in the field of public health law, it is crucial to consider the profound theoretical trends that transform the law pedagogy. That tendency toward these novel ways is not just a tendency toward edutainment but a rational answer to the cognitive and professional constriction of the Langdellian tradition.

2.1 The langdellian case method: strengths and systemic failures

The method of the Langdellian case is based on the premise that the law is a collection of objectively applicable principles that should be found by dissecting the judicial opinion [2]. The law library is the laboratory and the main specimen is the appellate decision in this model. Although this approach is a good way to teach students

to learn how to differentiate between precedent and how to create logical arguments with the help of stare decisis, it brings criticism since the critics view the method as a sort of systemic abstraction that decouples rules of law and social, political and operational contexts [9].

This abstraction is especially disabling in the particular setting of the public health law. Mostly, public health law is statutory and regulatory rather than judicial in nature [5]. It entails the future formulation of regulations to avert damage, not the future determination of damage that has taken place. By only studying the legal cases on public health, students observe only the mistakes, the quarantine order that was struck down in the court, the regulation that was ruled to be unconstitutional. They fail to recognize the negotiation process which was successful without going to court, the well-designed regulation which served as a means of ensuring that no further actions were taken, or the interagency phone call that organised a response to a disaster [9].

Moreover, the case approach is indicative of a common law culture that is becoming more and more out of touch with the actuality of the modern administrative state [5]. Since the judicial system has been supplanted by executive agencies (e.g., the CDC, FDA, state health departments) in the legal framework of the health of the people, the legal techniques once practiced by lawyers have changed their target from appellate advocacy to regulation design and regulation enforcement. The criticism is that the conventional legal training does not provide students with how to work in this "administrative state and students are unprepared to deal with the active, non-litigation work that is the predominant practice in the field of public health [5]. The use of Socratic method and casebooks generates a learning experience where in the first year students are frightened to death, second year to death and third year bored to death, which will result in a disengagement that simulations will be uniquely fitted to cope with [11].

2.2 Constructivism: building knowledge through action

Constructivism, a theory of learning, is the pedagogical counterpart to the transmission-oriented lecture because it presupposes that knowledge is not received passively, but instead constructed by the learner through experience [12]. Within a

constructivist model, the educator is made to act as a guide on the side rather than the sage on the stage and enables students to experiment, fail, and reflect [13].

The models on constructivism that are based on cognition underscore the importance of professional competence that develops best in situations where learners are compelled to put abstract principles into use in messy situations that are concrete. This is translated into Simulation-Based Education (SBE) in the law of public health [12]. SBE enables students to train the cognitive algorithms of legal decision-making, including ascertaining whether a particular collection of facts ought to have led to the exercise of police powers, in an environment where they do not face liability due to errors or lose their lives [13]. It is confirmed that these active learning activities can enhance legal knowledge and ethical competencies and make students internalize the material instead of just memorize it to take an exam [14].

2.3 Situated learning and communities of practice

Related to constructivism closely is the situated learning theory as formalized by Lave and Wenger. According to this theory, learning is a social process that takes place in a particular context or a community of practice [15]. Knowledge is situated within the activities, context and culture of its application.

In the legal training context, this theory supports the difference between the distal knowledge (textbook theory) and proximal knowledge (the context-specific knowledge of how to behave in a particular professional environment) [16]. The law student may also have the distal knowledge of the Public Health Service Act and the proximal knowledge of the implementation of the act in the middle of an interagency melee.

The simulations are a way to amaze into a so-called Legitimate Peripheral Participation (LPP) [15]. Through a realistic simulation, e.g., a roleplaying negotiation of a pandemics treaty, students are permitted to experience the activities of the profession at the periphery. They begin to speak, act and conform to the ways of life claimed by lawyers of public health, and become full-fledged members of the community. It is essential to professional identity formation because this kind of enculturation assists students in moving beyond student mode of thinking to practitioner mode of acting [12]. The simulation culture provides a hyper-real picture of professional practice, which is formed

under the influence of values, beliefs, and traditions of the sphere, and students receive an opportunity to test their professional identities [12].

2.4 Redefining the "signature pedagogy"

All professions possess a signature pedagogy a kind of teaching typology that determines the socialisation of novices into the profession. In medicine, it is the bedside clinical rotation; in law, it has been the Socratic dialogue and the moot court [11]. Nonetheless, researchers claim that the signature pedagogy of law needs to be modified to embrace simulation and clinical practice as the primary, and not the secondary, elements [17].

The traditional moot court is a simulation of a kind but has been severely criticized as a simulacrum that does not reflect the reality of legal practice [18]. It only concentrates on the argumentation of appeals without taking into account that most of the legal disputes are solved by way of negotiation, mediation or the administrative process. The new signature pedagogy of the law of public health would emphasize the so-called transactional learning simulations that would simulate the writing of contracts, promulgation of regulations, and the negotiation of policy [18]. This is in line with the clinical legal education movement that teaches the practical aspects of interviewing and counseling of clients and strategic planning using clinics and simulators [18].

3 SERIOUS GAMES AND DIGITAL SIMULATIONS

Games under the rubric of serious games, i.e. games whose main aim is not just entertainment per se, have become a powerful instrument of operationalizing constructivist and situated theory of learning in the field of public health law [19]. These digital intercessions make it possible to compress time and space, so that the long-term effects of judicial rulings can be experienced by the students in the context of a semester.

3.1 The "accord" simulation: a deep dive into global health governance

The illustration of the strictest example of a serious game in this discipline is the simulation called the Accord, which was constructed to educate students on the intricacy of negotiating a pandemic treaty and studying the global health governance [6]. To minimize the effect of preconceived notions of students about the real world geopolitics and to stimulate the interaction with legal and ethical dynamics on their own, the simulation is intentionally located in a fictional world of Zecan. In this created environment, the six countries are not placed with equal economic and political powers, with the high income countries starting with more resources, middle income countries working with mediocre capacities and low income countries enduring dire limitations. This asymmetry is not a background fact, but a pedagogical device, which helps participants to realize imbalances of power, scarcity, dependency and unequal bargaining power as a lived reality and not as an abstract notion. The monitor takes the role of a Global Health Organization, where he exposes outside shocks and directs deliberation, which is akin to the multifaceted tasks of international organizations in maintaining coordination, legitimacy and crisis management. This immersive structure helps students to have a more critical and reflective approach to the operation of global health law in circumstances of inequality, uncertainty and institutional constraint.

To extend the instability of the real world governance, the simulation also uses chaos players and disruptive injects, which disrupt predictable strategies and bring competing influences [6]. Among these players are the pharmaceutical lobbyists who are keen on protecting the intellectual property, civil society who voice concerns on the issues of privacy and indigenous rights, and the representative of healthcare workers who assert needs of labor protection which may come into conflict with the demands of emergency responses. These competing forces take students further than technical problem solving and force them to contend with the tension of politics, gray ethics, shortage of resources and competing priorities. By so doing, the participants are exposed to the fact that global health issues cannot be solved by legislation but rather they involve negotiation, compromise and tactical judgment. The approach to these interactions that is both systematic but random assists students in gaining better understanding of power, advocacy and institutional limits in attaining legal results.

The distinctive advantage of the Accord simulation is that it fully acknowledges failure as an important learning process. The factors that prevent students to ratify the treaty are the high voting requirements and the expense of cooperation, which resembles the real world impediments like the sovereignty issues, mistrust and self interest [6]. Instead of becoming a final point, this failure will become the point of departure of reflection and analysis. During the process of debriefing and writing about it, in many cases students are aware of how the individual rational choices might lead to collective irrational results, like those outlined by the Prisoner Dilemma. This hands-on experience of the failure of the system provides more insight than a theoretical discourse alone and allows students to perceive that there are structural roadblocks that have historically undercut international collaboration in organizations like the WHO.

3.2 The PRITS project: gamifying patient rights

Although Accord is concerned with the processes of macro level policy, the Patient's Rights and Innovative Teaching Strategy is the intervention that focuses on the micro level interaction of law and clinical practice [20]. The resource intensive aspect is emphasized in its development as it involved the cooperation with lawyers who were well versed in patient rights, lecturers in healthcare, educational scientists, and professional game designers. This interdisciplinary design allowed maintaining the legal accuracy and maintaining the engaging/pedagogical learning process, which proved that serious games can maintain the doctrinal purity and the need to provide a meaningful learning experience to the learner.

The distinctive characteristic of PRITS is that it assumes the use of the branching narrative structures where students are put into interactive dialogue with the virtual patients. By means of such simulated experiences, learners are motivated to reconsider professional responsibility and patient autonomy in practical terms. Instead of supporting a paternalistic concept of care where clinical judgment is the main driver of care, the simulation advances a rights focused paradigm where patient autonomy, transparency, and patient agency are the key elements [20]

Learners have to reflect on how their decisions impact trust, dignity, and accountability in the healthcare settings. This didactic effect is especially obvious in

situations when students are required to act as a doctor that should reveal to a patient a medical mistake. The simulation gives several response possibilities like covering the mistake, not making it very significant or doing complete revelation of truth, and each choice has various effects in the system. In case the virtual patient is faced with ethically or legally questionable decisions, the mistrust will become evident, and the program will outline the applicable legal principles including the informed consent. By designing it this way, PRITS transcends instruction on doctrinal rules and facilitates the internalization of professional values and obligations on which rights based clinical practice relies.

3.3 The "zombie apocalypse": engaging the public and professionals

One of the most commonly cited instances of public engagement with the help of serious games is the Zombie Apocalypse preparedness campaign created by Centers for Disease Control and Prevention that, in its turn, has entered the context of academic teaching [21-22]. Applying fictional zombie outbreak as a pedagogical tool has a conscious pedagogic effect by establishing a psychologically secure environment where students can discuss the legal and ethical topics of concern. Talking about mandatory isolation, emergency authorities, or limiting measures to prevent the spread of the disease in the real world as a case involving tuberculosis or pandemics can reflect defensiveness or emotional opposition. In comparison, presenting these problems in terms of zombie outbreak will enable the learners to explore the legal dynamics of quarantine, surveillance, and emergency control without the same emotional weight, but nevertheless address the principles underpinning the concept of the law of public health [22].

In a tabletop exercise or workshop where the topic of zombies is involved, the scenario is progressively made more complicated to pose more challenging legal and ethical dilemmas. When the fictional outbreak goes viral, students will have to think about whether activities like tracking exposure by using credit card data would be a legal way of monitoring public health and whether privacy rights like those in the HIPAA would be involved. They should also deal with constitutional concerns in instances where emergency officials are interested in requisitioning private property to be used by the government and the aspect of the Takings Clause as well as circumstances under which it might be necessary to pay compensation. Scarcity also makes decision making more

difficult and students have to deal with ethically and legally challenged allocation issues like whether prioritization of essential workers over children is legitimately possible when resources are scarce. This merges the intellectual rigor and a creative narrative approach with serious legal questions and can keep the students engaged and still inspire confidence in the approach that serious games can be used to teach with credibility and fairness complex aspects of public health law.

3.4 Virtual Reality (VR) and immersive evidence

The future of legal simulation is Virtual Reality (VR). VR provides the effect of presence or a feeling of being physically present in the virtual world [23]. The concept of virtual reality is becoming actively discussed as a potent means of changing the learning process of the legal concepts and professional skills. When it comes to mock trials and presentation of evidence, VR allows jurors or students who serve as mock jurors to have a three-dimensional walkthrough of places including contaminated sites in place of the use of still photos. This experiential approach to interaction implies important consequences to such fields as environmental health law and toxic torts since it can enhance the understanding of spatial, contextual, and causal connections that tend to be hard to perceive only using the traditional exhibits [24]. Restructuring the perception and interpretation of evidence, VR can not only change the education of law enforcement agencies but the practice of law in the future.

In addition to the evidentiary use, VR is also being applied to develop ethical sensitivity and professional competence. By adopting the role of a client with a disability or a patient in an overcrowded emergency department through empathy focused simulations, students are able to gain insight into a situation that may lead to heightened emotions, which is likely to help them reduce implicit bias, an indispensable skill in a lawyer dedicated to enhancing health equity [23]. Concurrently, VR facilitates the development of the practical skills via compliance training that puts the learners in the real world where they have to detect hazards like biosecurity threats, which provides a better measure of attention and judgment compared to the traditional checklists [25]. These applications combined demonstrate how immersive technologies can enhance legal and public health education by interconnecting cognitive knowledge with experience.

4 ANALOG SIMULATION: TABLETOP EXERCISES AND MOOT COURTS

Nonetheless, analog simulations, namely Tabletop Exercises (TTX) and Moot Courts, still play the major role in the training of practical law. These are the low-fidelity simulations which are based on human interaction and imagination instead of software code.

A Tabletop Exercise is a facilitated communication of a simulated emergency that is developed to assess plans, policies and legal authorities [26]. A TTX is in its legal sense a stress test of the legal infrastructure of a jurisdiction, with respect to the law of public health.

A strong TTX is propelled by a Situation Manual (SitMan) that describes the scenario baseline, and a sequence of injects, which develops the timeline [27]. These injects are used by the facilitator to interrogate certain legal weaknesses.

Table 1

Legal Inject Matrix for an Isolation & Quarantine TTX

Phase	Scenario Event	Legal Injects / Facilitator Probes	Target Competency
Phase 1: Pre-Event	Intelligence reports suggest a novel flu with high mortality is spreading in a neighboring state.	Does the Health Commissioner have the authority to declare a pre-emptive state of emergency? What triggers this power?	Statutory Interpretation [28]
Phase 2: Response	A cluster of cases is identified at a local university. Students are attempting to leave campus.	Can we legally cordon off the campus? What is the standard of proof required to detain asymptomatic students?	Due Process & Movement Restriction [28]
Phase 3: Surge	Hospitals are at 120% capacity. Staff are requesting liability protection before implementing crisis standards of care.	Does the state's Good Samaritan law cover gross negligence? Can the Governor grant immunity by executive order?	Liability & Malpractice Law [28]
Phase 4: Recovery	The outbreak subsides. Businesses demand compensation for closure periods.	Does the closure constitute a regulatory taking requiring just compensation under the 5th Amendment?	Constitutional Law & Takings [28]

The tabletop exercise as a pedagogical tool eventually leads to the After Action Report which is also known as AAR [26]. This is not just a document of events, but a well-organised analytical task in which the students have to question the underlying agents of success and failure in the simulation. The AAR used in learning law forces students into the distinction between failures in decision making due to lack of law

making authority, inadequacy in legal knowledge, or unwillingness to take action due to fear of being held liable. This reflective experience involves students relating the experiential involvement with the theoretic knowledge and the institutional dicta, thus, converting the practical experience into the disciplined legal thinking process. The AAR is thus a summative exam requiring students to integrate their learning and convert it to tangible policy proposals enhancing professional judgment and supporting accountability in simulated legal practice.

In addition to these changes in experiential evaluation, the old model of moot court has evolved a lot as well. Traditionally, moot court has been designed with the idea of appellate advocacy, which can be characterized as a vision of professional activity in the legal sphere where the top courts are the main arenas of activity. Such an inclination is however becoming a distortion of the realities of the public health law where in most instances conflicts are settled by administrative hearings, regulatory negotiations, and policy considerations rather than constitutional litigation in the Supreme Court. This shift is starting to be reflected in the contemporary moot court formats. In such competitions as the National Health Law Moot Court Competition, now participants are to work with complex problems of administrative law and regulatory reasoning, including whether an agency like the FDA has acted capriciously and arbitrarily under the Administrative Procedure Act [11]. This focus takes students out of the field of rhetorical performance and into the field of a closer interaction with statutory interpretation, institutional competence and regulatory legitimacy.

Advocacy education has continued to be transformed by the growth of virtual moot courts in the COVID-19 era, as it now reflects more closely the reality of modern practice [29]. The remote formats have exposed students to rich experience of digital professionalism, online advocacy and communication in virtual settings, which is currently part of contemporary legal practice. Meanwhile, this change has revealed major injustices. Variations in the availability of stable internet, good sound, and professional video delivery may affect perception of credibility and performance, creating an unequal situation that does not depend on the legal competence in reality [35]. These issues pose some massive questions on fairness and equity in the evaluation when technology is woven into the evaluation. Critics have also thought that remote advocacy also reduces the presence aspect and the capacity of the students to discern nonverbal cues, which have

always been regarded vital in terms of effective oral argument [29]. However, this criticism should be weighed against the fact that digital advocacy has now been made a direct professional competency. When the new approach where courts, tribunals, and other legal bodies are becoming increasingly hybrid and more remote, it is no longer a choice but a necessity to be able to communicate persuasively and professionally through digital platforms [30]. Combined, these changes indicate that the AAR, as well as the changing organization of the moot court, is a larger eventual move in legal education towards more authentic, reflective, and practice aligned types of learning and evaluation.

5 LEGAL EPIDEMIOLOGY AND THE "MONQCLE" CURRICULUM

Probably, the most influential theoretical contribution in modern public health law education is the rise of legal epidemiology, which is the scientific study of law as a determinant of health [4]. This methodology represents a departure of looking at law as doctrine and instead investigates how law works as practice and generates social results that are measurable. Instead of considering statutes and regulations as abstract documents, legal epidemiology reformulates law as data, which can be systematized to gain insight into its practical impacts. One of the key instruments in the development of this strategy in the educational sector is the MonQcle platform which is a web based application created by the Center of Public Health Law Research to facilitate the surveillance of policies by using the systematic gathering and examination of legal texts [31].

MonQcle has a pedagogical value in the nature it changes the interaction of students with legal content. Treating law as data, students are forced to apply concepts of law to create precise and observable categories rather than applying law through broad or impressionistic interpretation. Such an organized process encourages a disciplined way of thinking and aligns the legal argument with the concepts typically linked to scientific investigation [31-32]. It usually starts with the development of questions, in which the students have to encode abstract legal terms into detailed, answerable coding questions, including whether a statute requires a particular penalty or follows a rigorous regulatory criterion. This compels the students to address ambiguity in the law texts and become more accurate in their interpretation. This further entrenchment occurs with the process of redundant coding, where the same legal materials are independently coded by multiple

students and then discrepancies are settled by means of organized discussion. This has not just been a way to reveal the inconsistency of the interpretation of the law but also teaches the students on how to rationalize their position based on evidence and rigorous study over just being an opinion. The last step of the workflow learning is expanded beyond interpretation and into evaluation. After coding legal data, students can connect these data sets to public health outcomes and investigate law-empirical impact relationships. To illustrate, a comparison of the outcomes of texting while driving laws and traffic death rates will expose the learners to quasi experimental argument, regression analysis, and causation in applied legal use [31]. In this process, students have been able to acquire analytical competence besides forming a more profound study of the way law can be examined in a systematic manner as a determinant of population health.

5.1 Curriculum integration and educational implications

In addition to the technical application of such platforms as MonQcle, the introduction of legal epidemiology into official curricula is a more significant change in the organization of the education of public health law. Other higher education institutions like the University of North Carolina at Chapel Hill and Temple University have created coursework that integrates legal epidemiology techniques into the main curriculum instead of viewing them as supplementary materials [33]. Such curricular designs represent a conscious shift towards competency based education where learning outcomes are pre-defined, and instructional activities are determined in relation to the pre-determined outcomes. Backward design is a concept used by educators, who identify which skills students will have by the course completion, like understanding the results of statistical studies or being able to properly evaluate the effectiveness of policies, and then design learning activities and assessments that explicitly develop those skills [33]. This way is a guarantee of consistency in teaching, learning, and assessment as it avoids superficial or unstructured use of such technological tools.

Interdisciplinary learning and authentic assessment are also highlighted in these models of curriculum. Through the admission of students with both legal and public health experiences, the learning environments will result in collaborative classrooms where divergent professional viewpoints overlap, which is a reflection of the complexity

of modern-day public health practice [33]. This is achieved through an interdisciplinary design that enables students not only to learn within the educators but also to learn within each other, thus acquiring skills in communication, and development of professional identity. Real world relevance is further enhanced through assessment in these programs. Instead of using a combination of conventional tests, students are assessed using practical projects like policy surveillance study design, datasets creation in MonQcle, and writing research papers that can examine patterns across legal systems [33]. By this design, learning will be experiential, participatory, based in practical application, which serves to affirm the move toward passive learning to active engagement with law as a tool of learning and application.

6 ETHICAL CHALLENGES AND THE DIGITAL DIVIDE

Implementation of gamification and high-tech technologies in the field of legal education presents considerable ethical and structural issues which should be approached with due caution. Although these tools present mighty possibilities of interaction and creativity, they also demand that educators stroll in a fine line of purposeful pedagogy and vacuous entertainment, and of technological progress and accessibility. Pedagogical innovations without conscious planning and critical attention may bring down the professional values that they want to establish.

Among the most obvious ethical issues related to gamification is the possibility of trivialization. The subject matter of legal education concerns issues of the most significant social concern such as liberty, justice and life itself. Trying to simplify these complicated topics into point systems, badges, or competitive awards may diminish the seriousness of the content matter and corrupt the idea of professional responsibility among the students [34]. Critics have termed this phenomenon as, so-called chocolate covered broccoli, where elements of gamification applied on surface level conceal stultifying pedagogies and markets superficial gamification as constituting students as consumers, instead of the future professionals who ought to be challenged intellectually and ethically [34]. Educational games not well constructed can thus undermine, instead of supporting, the moral and intellectual principles which legal education is supposed to create.

Along with the issue of trivialization, gamified settings also have the danger of oversimplification and bias. Numerous games are based on linear patterns, rule based reasoning, binary solutions, but the law practice is marked by ambiguity, negotiation, and conflicting values. Simulations that reward competition by use of aggression or focus on winning rather than cooperation may inadvertently foster incompatible values to what effective practice of law in the field of public health ought to be; that is, relational and cooperative [34]. Also, serious games are informed by assumptions that are inherent in their design. Unless narrative structures, variables, or character roles are created based on critical thought, simulations can reproduce algorithmic bias and support damaging stereotypes instead of challenging them, including in sensitive fields like criminal justice or safety [35]. The application of these tools ethically thus demands a deliberate focus on inclusivity, representation, and value congruency during the development of the design.

Equity and access are other areas of serious concerns about technology innovation. The growth of virtual reality platforms and AI-driven simulations and the fast pace at which they are being developed has escalated the legal education digital divide [35]. Institutions with substantial funds will be able to purchase advanced infrastructure, special laboratories, and paid platform subscriptions, whereas institutions with low resource bases, usually in marginalized communities, might be unable to access similar technologies. Such a gap can be converted into technological fluency differences amongst graduates, and these differences will lead to extended term differences in confidence, perceived competence, and professional opportunity. Instead of being tools of democratization, pedagogical technologies are consequently dangerous of strengthening the same inequities that are avoided in public interest oriented legal education.

These differences also work at individual student level. Students with less privileged socioeconomic status might not have access to good internet, high performance devices, and space, which can all influence their engagement in virtual simulations and online advocacy activities. These limitations may destroy performance and self-confidence, which contributes to structural disadvantage even more [35]. To handle these issues, institutional strategies should be formulated to focus on both equity and innovation. Teachers are being motivated to embrace the use of technologies that work well on low cost machines, offer equipment loans and use open educational resources and open source platforms wherever feasible. Such actions are necessary in case the new

pedagogical tools will increase opportunity instead of locking it out, and the legal education innovation will be used to promote inclusion and not exclusion.

7 ASSESSMENT, COMPETENCY, AND EVALUATION FRAMEWORKS

7.1 The CDC public health law competency model

The Centers of Disease Control and Prevention (CDC) has constructed a Public Health Law Competency Model that has been used as the guideline to design the curriculum [28]. The model establishes the skills at three levels (Entry, Management, Executive).

Table 2

Alignment of Simulation Activities with CDC Competencies

CDC Competency Domain	Specific Competency Statement	Simulation Activity	Assessment Metric
Domain 1: Systems Preparedness	Act within the scope of federal/state statutory authority during emergencies.	"Zombie Apocalypse" / Pandemic TTX	Facilitator checklist: Did the student cite the correct statute for the emergency declaration? [27]
Domain 2: Management of Property	Implement legal tools (injunctions, closing orders) to protect public health.	MonQcle Mapping Project	Coding accuracy score: Did the student correctly identify "closure authority" in state laws? [28]
Domain 3: Management of Persons	Apply principles of due process to isolation and quarantine measures.	PRITS Patient Rights Game	Decision-tree outcome: Did the student choose the option that respected patient notice and hearing rights? [28]
Domain 6: Ethics	Educate individuals on the meaning, purpose, and benefit of public health laws.	"Accord" Treaty Negotiation	Peer evaluation: Was the student's communication transparent and ethically grounded? [28]

7.2 The Kirkpatrick & CIPP model of evaluation

To sustain the impact of these pedagogical innovations over time, educators need to make use of robust evaluation frameworks. In this context, two of the most important models are the Kirkpatrick Model and the Context, Input, Process and Product (CIPP)

Model. Though both frameworks offer a systematic method for evaluation, they are grounded in distinct theoretical frameworks and are utilized by different institutional needs [39].

The Kirkpatrick Model, developed by Donald Kirkpatrick in 1959, is the best-known framework for evaluating training program outcomes [40]. The Kirkpatrick Model is mainly outcome-centred and reductionist, rooted in the idea that the impact of a program could be ascertained if it could be decomposed into four distinct levels: Reaction, Learning, Behavior, and Results [36]. This is a very appropriate model for "proving" the success of a program, especially when the people who have undertaken the program want figures on the learning achieved or the return on their investment (ROI) [41]. Level 1 (Reaction) assesses how participants felt about the delivery, and Level 2 (Learning) uses a pre- and post-test approach to assign a numerical value to what has been learned. Level 3 (Behavior) examines the application of skills on the job and Level 4 (Results) evaluates the final impact on the organization or society [36].

By contrast, the CIPP Model developed by Daniel Stufflebeam is based on complexity theory and conceptualizes educational programs as open systems that interact dynamically with their context [38]. This focus on formative evaluation differs from that of Kirkpatrick, who sought hard evidence to prove outcomes — the CIPP Model, on the other hand, aims to "improve" the program, using continuous formative evaluation. It includes four elements: Context evaluation (evaluates needs and readiness in the environment, Input evaluation (examines resources and design, Process evaluation (monitors implementation, and Product evaluation (measures intended and unintended effects) [38].

This model is more suited when the evaluation you are conducting is at an early stage or for exploratory purposes. Since Kirkpatrick is meant to assess whether a particular simulation—like a moot court or a online game—meets its specific learning outcomes [36], it is best suited for this purpose. However, it is also reproached for ignoring signaling processes that suppress or enable these effects [39]. We believe The CIPP Model is a more appropriate choice for the long-term development and updates on a wide-field public health law curriculum as it provides policy-makers with the information required for their continued fine-tuning effort while the program is still under way [38]. More recent studies focus on the fact that CIPP is most useful for competency-

based education (CBE) and virtual learning; in such a case, it hybridizes with quantitative tools for addressing complex educational contexts [38]. These models, used in conjunction, pull in big picture data on institutional improvement and small, melty pieces of data on each student that bakes them together into the perfect learning food.

Table 3

Comparison of Kirkpatrick and CIPP Models for Evaluating Educational Simulations

Evaluation Focus	Kirkpatrick Model	CIPP Model
Purpose	Emphasizes measuring effectiveness based on outcomes for learners and organizations [36]	Emphasizes continuous improvement and informed decision making across program stages [37].
First Dimension	Reaction: learner satisfaction and engagement, measured through post-simulation surveys [36]	Context: assesses needs, environment, and relevance of the simulation [37]
Second Dimension	Learning: knowledge and skill acquisition, measured through pre- and post-tests [36]	Input: evaluates instructional design, resources, and planning before implementation [37]
Third Dimension	Behavior: application of learning in real settings, measured through observation or follow-up [36]	Process: examines implementation quality and alignment with intended design [37]
Fourth Dimension	Results: long-term impact such as organizational or professional effectiveness [36]	Product: assesses short- and long-term outcomes including unintended effects [37]

7.3 Rubrics and standardization

Due to the inherently open ended and unpredictable nature of simulations, the evaluation of the simulation needs to be done through well developed rubrics to maintain fairness, transparency and reliability in grading [4]. In effective rubrics, the primary focus is made on the process rather than on the result, because a student might not attain some of the formal goals, like treaty ratification during a negotiation practice, but still can show significant reasoning, strategy and ethical consciousness, which should be rated with high scores [6]. They are also supposed to judge legal judgment by evaluating the ability of students to recognize issues of law and apply the right principles of law and accept the uncertain or limits in their knowledge, as opposed to the application of superficial confidence alone [4]. In group simulation, the evaluation should not focus solely on personal proficiency, but also on interpersonal aspects, which explains why a significant number of instructors include the elements of peer review in their simulations that enable

students to evaluate not only the individual performance but also the teamwork, communication and professionalism, thus replicating the overall competencies that legal practice of the real world requires [6].

8 CONCLUSION

The metamorphosis of the discipline of public health law education as passive and case based into active and simulation based are not simply a matter of pedagogical taste; they are simply a matter of professional need. The intertwined, cross-national, and information-intensive needs of contemporary public health necessitate personnel that has practiced the law prior to the onset of a crisis requiring them to enforce it.

The inventions described in this report, including the high-stakes game of diplomacy tested during the game of the Accord, and the intensive coding of the MonQcle platform, are the scaffolding of learning in this new form. They reconcile the difference between the distal knowledge of the classroom and the proximal knowledge of the field. These tools inculcate resilience and flexibility that the 21st -century public health practitioners needs by enabling the student to experience a state of failure, to grapple with ethical ambiguity and to manipulate legal data.

This future is not solid, however. The digital divide threatens it, and it could potentially leave out the most required students in terms of their role in ensuring health equity. The danger of trivialization, according to which the grave business of justice is turned into a game, is opposed to it. And it is bound by institutional inertia, which adheres to the cheap is high-prestige Langdellian model.

Legal educators should be intentional in their endeavour to succeed. They should come up with simulations that have theoretical constructivism and situated learning. They need to review these interventions like the Kirkpatrick and CIPP models. And they should make sure that technology will be used as a medium of inclusion rather than a medium of exclusion. With these conditions in place, gamification and simulation of public health legislation education can offer a generation of advocates that not just thinks like lawyers, but also acts like leaders in the service of defending the health of the population.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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