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Using a cooperative board game to examine One Health teamwork functions under pressure

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Abstract

Health threats at the human–animal–environment interface demand joint decisions across public health, veterinary, and environmental agencies, yet institutional mandates and siloed data systems frequently hinder effective coordination. While One Health frameworks identify enabling functions such as communication, collaboration, coordination, and capacity building, these routines are often managed implicitly during stable periods but become fragile during crisis. Educational curricula often rely on broad competency domains that provide limited guidance on the observable behaviors required to maintain these functions as conditions shift from routine to emergency response. To address this gap, this study uses a cooperative board game as a time-limited activity that creates interdependence and moments of escalating pressure to expose how stable teamwork functions, degrades, or adapts under threat. The seminar was refined across four annual cohorts of the programme between 2020 and 2023. The analyzed dataset comes from the 2023 cohort of 13 multidisciplinary practitioners, studied across three consecutive play sessions. A hybrid deductive–inductive thematic analysis of gameplay and structured debrief discussions describes how learners enact and articulate specific routines. These descriptions include how they resequenced steps, checked rule requirements, and paused briefly to regain a shared understanding of the evolving situation. The findings show how time-limited tasks draw attention to tensions between immediate containment actions and longer-term progress toward shared objectives. The study proposes that structured game activities offer a reproducible

environment for learners to notice and describe teamwork behaviors relevant to One Health training and assessment.

Keywords: One Health education; teamwork; serious games; communication; collaboration; coordination; debriefing; design-based research.

Introduction

Health threats at the human–animal–environment interface often require public-health, veterinary, and environmental agencies to make decisions that depend on each other's information. These decisions remain difficult when institutional mandates and data systems operate separately, creating delays or uncertainty about how actions in one domain influence conditions in another (Ruckert et al., 2020). To manage such risks, One Health offers a shared approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems while recognizing their inherent interdependence (OHHLEP et al., 2022).

This interdependence sets a practical requirement for implementation, as actions taken in one domain can fundamentally change the risk profile in another. Implementation guidance addresses this reality by identifying specific functions that support joint activity, most notably within the Quadripartite One Health Joint Plan of Action (FAO et al., 2022). The Joint Plan identifies four enabling functions: collaboration, communication, coordination, and capacity building, which we refer to as the four Cs.

The four Cs provide a framework for integrated action where communication facilitates information exchange and coherent messaging, collaboration and coordination align joint objectives across diverse mandates, and capacity building strengthens the knowledge, skills, procedures and conditions needed to sustain these functions (OHHLEP et al., 2022). In this educational setting, capacity building is approached more specifically as repeated practice and improvement of these functions. Such alignment is a central focus of One Health education, which often draws on competency syntheses to specify what practitioners should be able to do in cross-sector settings.

While competency syntheses emphasize essential domains like roles and systems thinking, they often offer limited guidance on the observable behaviors that learners can actually practise or instructors can assess (Frankson et al., 2016; Laing et al., 2023). This lack of behavioral specificity becomes more salient when teaching targets must support performance under the intense time pressure characteristic of crisis conditions.

Crisis conditions serve as a critical "stress test" for teamwork, as urgency, threat, and uncertainty intensify the demand for enabling functions (Parker et al., 2020). Beyond organisational complexity, outbreak settings are associated with psychological strain, which can place additional

pressure on the interactions and coordination required during a response (S. K. Brooks et al., 2018; Serrano-Ripoll et al., 2020). Using crisis as a lens provides a rationale for the identification of the specific behaviours that "make or break" coordination, contributing to training and assessment. Responding to this teaching gap, the current study observes learner activity during a cooperative board game with rules that create interdependence, limited actions per turn, and abrupt board changes under time pressure.

Specifically, we use *Pandemic*, a commercially available cooperative board game, to simulate escalating infectious disease threats under resource and time constraints. The activity is a serious game, a game built for a purpose beyond entertainment, here education and training. The game is not a crisis simulation in the strict operational sense. It generates structured pressure through outbreak cascades, role interdependence, and action limits.

Observing activity during the game allows for a detailed analysis of what participants do and say during both play and debriefing. By using the four Cs as a guiding lens drawn from implementation guidance, we aim to describe candidate behaviors that may serve as suitable targets for practice and feedback in education. These descriptive aims inform our primary research objectives.

Research objectives

This study asks how learners enact communication, collaboration, coordination, and capacity building during a serious game team task. It also asks which features of the activity and the reflection format create opportunities for these behaviors to be enacted and articulated. We address these questions by examining what participants did and said during play and debrief discussion in a shared task setting.

Setting and participants

The seminar ran within the Integrated Management of Health Risks (IManHR) master's programme, jointly delivered by the University of Liège, the Université libre de Bruxelles, and the University of Namur (Sidikou et al., 2022). The seminar sits in an organisational learning module. The module addresses the management of complex systems, the strategic steering of risk, and transdisciplinary approaches to collective action. Within this frame, the game lets participants experience how team functioning holds or degrades under risk, in line with the four enabling functions of One Health.

The seminar ran for four cohorts of the programme from 2020 to 2023, with 55 participants in total across those years. Cohort sizes were 13 in 2020, 15 in 2021, 14 in 2022, and 13 in 2023. Across these cohorts, 31 participants were men (56%) and 24 were women (44%). Participants came from West, Central, and East Africa, alongside participants from other regions. Their disciplinary backgrounds were in medicine, veterinary medicine, environmental and agricultural sciences,

public health and epidemiology, social sciences and management, biomedical quality and pharmaceutical fields, and nursing. The data analysed in this study come from the 2023 cohort of 13 participants. Figures for 2020 to 2022 describe the development of the seminar and are not analysed as results.

Seminar development across cohorts

A design-based research approach guided seminar delivery, with each cohort informing small, documented adjustments (Wang & Hannafin, 2005a). From 2020 to 2022, more than one facilitator observed each session and recorded delivery notes. These notes recorded practical implementation issues affecting the flow of the students' activity during the sessions, including time spent clarifying rules and difficulty reconstructing decision points during debrief discussion. The facilitator notes informed cohort-level adjustments that were retained for the 2023 delivery, including added preparation for rules and role capabilities, an individual oral check, play sessions scheduled on consecutive days, and a standardized two-step reflection format. In this paper, these notes serve as a record of seminar development. They are not analyzed as results, and they do not extend thematic claims beyond the 2023 dataset.

Task environment

The seminar used *Pandemic*, a commercial cooperative board game designed around shared decision-making in which participants act as a single team facing a sequence of escalating threats on a world map (Figure 1). Each participant takes a specialist role with a distinctive ability that changes which actions they can complete efficiently during play. The task proceeds in turns, and each turn provides a fixed number of actions. These actions include moving between connected cities, treating cubes that represent disease presence, giving or receiving cards, and building a research station needed to develop a cure from card sets of the same color. In the seminar, the team's immediate target was to discover three cures within the allotted time.

After each participant completes their actions, the rules introduce new pressures. The player draws cards that may trigger an epidemic event, which increases infection intensity and reshuffles previously drawn city cards back to the top of the infection deck. This procedure raises the likelihood that the same cities will receive additional cubes soon after. If a city already holding three cubes receives a further cube, an outbreak occurs. An outbreak spreads cubes to all adjacent cities, increasing the overall pressure on the team and making subsequent outbreaks more likely if those neighboring cities are already strained.

The game includes several ways to lose. One condition arises if outbreaks occur too many times in a single session. Another appears if the team has no cubes left in the supply when the rules require the placement of new cubes. A third occurs if the player-draw deck is exhausted before the team discovers the required cures. These conditions make timing, coordinated movement, and

resource distribution central to team decisions during play. The seminar followed the published rulebook for turn structure and loss conditions. Gameplay was paired with written decision records and structured reflection, allowing teams to reconstruct key episodes and explain how they organized action under time constraints.

Cooperative play in Pandemic has served as a task for studying teamwork constructs, including cooperation, communication, and coordination (Anania et al., 2016). Its structure suits observation of the enabling functions for three reasons. Role differences make players depend on one another to reach the win condition. A fixed number of actions each turn forces choices about sequence and priority. Epidemic events and outbreak cascades change the board quickly and press teams to revise plans under time constraints.

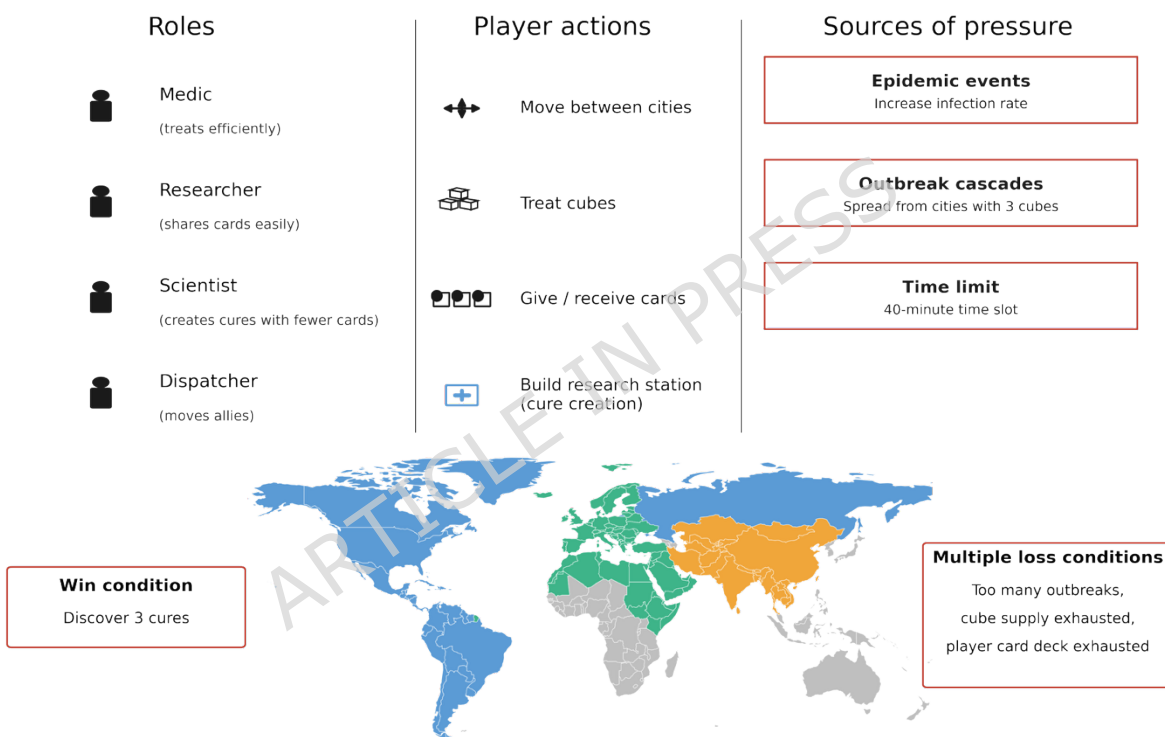


Figure 1. Overview of the Pandemic Task environment used in the seminar. *Players take specialist roles and complete a limited set of actions each turn to progress toward discovering three cures. Epidemics, outbreak cascades, and time limits generate escalating pressure, while losses occur if outbreaks accumulate, cubes run out, or the player deck is exhausted. The shared world-map board and interdependent roles create a time-pressured cooperative task suited for examining teamwork behaviors. Figure created by the author in Python (matplotlib, geopandas); world map boundaries from Natural Earth (public domain, [naturalearthdata.com](https://www.naturalearthdata.com/)).*

Facilitation and seminar structure (three-day team composition)

Facilitators had backgrounds in psychology, adult learning, and mediation, with additional support from colleagues with a background in health risk management. Each seminar began with a short learning contract that stated aims, ground rules, and learning objectives. During the game, facilitators restricted their input to brief clarifications.

Preparation included two preliminary sessions. Participants first completed a short discovery play session to become familiar with the core mechanics. Each participant then completed an individual oral check at a later date. The check covered turn order, win and loss conditions, card functions, permitted actions, outbreak and epidemic procedures, escalation rules, and role capabilities. These steps aimed to support rule fluency before timed play.

The core seminar ran across three consecutive days with the same cohort of 13 participants. Each day, a 40-minute play session was paired with structured reflection. The cure target increased across the three days: one or two cures in the first session, two in the second, and three cures in the third. Tables were re-formed by random allocation each day, so participants worked with at least two different members across the three sessions. The three sessions carried a staged focus. The first session set up group formation and gave practice in observation and reflection. The second session addressed structures, routines, and the handling of unexpected events. The third session addressed roles for organizing the team and the task.

Each table included four active player roles and one observer role. The observer role rotated among the players at each table and recorded key in-game events to support later reconstruction. This staged design supported two forms of progression across the three sessions: mastery of the game and the learning focus examined in this study. The full pedagogic design appears in Supplementary Material S1.

Ethical clearance and informed consent.

All methods were carried out in accordance with relevant institutional and national guidelines and regulations. The study protocol was reviewed by the Comité d'Ethique Hospitalo-Facultaire Universitaire de Liège (Reference: 2026/270). The Ethics Committee determined that this study does not fall within the scope of the Belgian Law of May 7, 2004, regarding experiments on the human person. Consequently, the Committee raised no ethical objections to the realization and publication of this research. Written informed consent for audio recording and image capture for research use was obtained exclusively from the participants in the 2023 cohort. For the earlier cohorts (2020–2022), data collection was limited to programmatic evaluation; facilitators took only observational notes on delivery and practical implementation to guide adjustments for future sessions. As these earlier notes were used only for iterative structural improvements and are not analyzed as research results in this study, formal informed consent for research publication was not required or obtained for the 2020–2022 cohorts.

Structured reflection

Reflection followed a two-step format, designed and led by a facilitator with a psychology background. The design centered on two forms of team cohesion and on interdependence among members and tasks. Operational cohesion referred to alignment on shared objectives and deliverables. Affective cohesion referred to group functioning, trust, and mutual support. These design principles overlap with the four enabling functions used as the analytic frame.

The first step took place at the table level immediately after timed play. Participants first reflected individually on what they had learned about how their team approached the task, and how they themselves approached it within the team. They then shared these at the table. Facilitators prompted teams to reconstruct the end state of play, identify key decision points, and name planned changes they had not carried out. Further prompts addressed team functioning, including follow-up on proposals, sequencing of actions, use of roles to coordinate shared action, and how each participant had contributed. A closing prompt asked participants to shift attention from the excitement of play toward the content and the process of their collective work, and to describe points where pressure constrained speech or action.

The second step took place at the cohort level. Each table shared one transferable lesson from the session. The cohort closed with a prompt asking participants to name one teamwork practice they intended to apply in the next session. The full reflection and the prompt set design appear in Supplementary Material S2.

Data collection

We recorded audio continuously during gameplay, the table debrief discussion, and the cohort debrief discussion. Observers produced structured notes using a shared template organized around two axes. The first axis covered explicit and implicit behaviors, with a note of what occurred and who produced it. The second axis separated how the team organized itself, covering objectives, methods, time, and communication, from the content of its decisions. The template also held time-stamped markers for key events, including epidemic draws, outbreaks, research station placement, and cure discovery. It recorded proposals raised, how the team reached agreement, and changes in the board state. Facilitators wrote field notes during and after observation of play and reflection. We retained artefacts produced during play, including decision records and written planning notes. The observation guide appears in Supplementary Material S3.

Data analysis

The study takes an interpretivist stance. It reads participant statements and observed action as situated accounts of how a team organized itself under constraint. We analyzed the 2023 dataset using a hybrid deductive–inductive thematic analysis, combining an a priori framework with codes

developed from the material (Kiger & Varpio, 2020). The dataset comprised audio recordings, observer notes, facilitator field notes, and game artefacts from the 2023 cohort ($n = 13$).

The deductive structure came from the four enabling functions of the Quadripartite One Health Joint Plan of Action: collaboration, communication, coordination, and capacity building (FAO et al., 2022). Capacity building was examined through how participants developed, stabilized, and reused ways of explaining decisions across the three play sessions of the 2023 cohort. Alongside these functions, we coded the task features that participants referenced during play and debrief discussion, including action limits, role differences, and outbreak cascades. Facilitator contributions were coded when they occurred within the recorded interaction.

The first and second authors carried out coding. The first author observed the 2023 cohort directly. The second author had taken part in earlier cohorts and had supplied facilitator notes across that period, providing close knowledge of the seminar structure. The second author did not deliver the 2023 sessions. The first author was also present to clarify the rules for participants, only if they appeared to be making an obvious error and did not facilitate the reflections. This familiarity with the seminar supported the reconstruction of decision points. When interpretations differed, the two returned to the excerpts and the study aims, which kept readings anchored to the material.

Analysis proceeded in two cycles. In Cycle 1, we developed descriptive codes tied to observable action and participant statements during gameplay and debrief discussion. Codes captured short interaction sequences, such as proposing an action, checking for understanding, and committing, together with rule references, requests to pause, and revisions following epidemic events and chained outbreaks. Microsoft Excel held the excerpts and linked codes to transcript segments. After major revisions to the code set, the two analysts recoded the same focal segments to support consistent application of the shared codebook, resolving differences by returning to the excerpts.

In Cycle 2, we regrouped descriptive codes against the study design. One grouping captured how the four functions were expressed during play and during reconstruction in the debrief discussion. A second captured the task features shaping attention and urgency, including action limits, role differences, and cascades. A third captured seminar supports shaping recall and collective sensemaking, including preparation steps, observer notes, and the staged reflection format.

The three consecutive play sessions within the 2023 cohort provided the temporal frame for examining change across repeated encounters. Excerpts were compared across the three sessions to examine how participants expressed communication, collaboration, and coordination with repetition, including where they found aspects difficult to name or justify. Capacity building was examined through these shifts in what participants could articulate and carry from one session to the next.

Quotations were selected to illustrate a coded function clearly and to represent more than one table where possible. Excerpts were lightly edited for readability, with source tags indicating gameplay, table debrief, or cohort debrief. As a framework-oriented analysis, the study did not seek an intercoder agreement statistic. Consistency came from the shared codebook, the two-analyst recoding of focal segments, and an audit trail linking codes to excerpts in the coding file. We keep interpretive claims within the scope of the 2023 cohort dataset.

Results

The analysis produced six themes; each linked to one or more of the four enabling functions and to the task features that shaped action under time pressure. Themes 1 and 2 concern how teams built a shared plan and how visible escalation constrained participation. Themes 3 and 4 concern repair after late rule or role reminders and the sense of collective responsibility for decisions. Themes 5 and 6 concern sequencing and commitment under the time limit, and the checking routines teams used as the board state changed. Table 1 shows how the four functions map to the codes and themes.

Table 1. Mapping of the four enabling functions to representative codes and themes.

Enabling function (FAO et al., 2022)	Working definition	Representative codes	Theme(s)
Collaboration	Joint work toward shared objectives across roles	Building a shared plan; acting on behalf of the team; transferring resources; dividing responsibility	Theme 1, Theme 4
Communication	Exchange of information and coherent messaging during action	Locating card holdings and role abilities; reduced listening under escalation; reduced uptake of proposals	Theme 1, Theme 2
Coordination	Alignment of action, sequence, and timing across members	Ordering steps aloud; agreeing a strategy; repair after late rule or role reminders; checking against rules and strategy; structured pauses	Theme 3, Theme 5, Theme 6
Capacity building	Growth in what participants can explain, stabilise, and reuse across sessions	Naming a previously missed rule or role capability; restating a checking routine; carry-forward of a reusable sequence	Theme 3, Theme 6

Theme 1. Shared plan formation

Participants reported an opening period in which the group built a shared plan before committing to early actions. One team recalled that alignment took time: “At the beginning, it was difficult to understand... it takes a bit of time for all team members to get in step... and realize what we actually had.” [Table debrief] Another participant presented movement and action as decisions made with the group: “No one can succeed alone... before moving from one city to another we asked: where can I go... You define the actions together.” [Table debrief]

Gameplay statements show short prompts used to locate resources needed for the next step. After board changes, teams asked questions such as “Who has black cards?” and “Who can build?” [Gameplay] These prompts directed attention to card holdings and role abilities that shaped what the team could do next.

Theme 2. Participation strain under visible signals of escalation

Some participants referred to outbreak escalation and cube scarcity when explaining reduced listening and reduced uptake of proposals. One participant said the repeated focus on outbreaks shaped what they chose to voice: “You want to share an idea but there is already someone’s influence... since one person talked a lot about outbreaks... you have an idea... then at some point you let yourself be influenced by ‘outbreak’.” [Cohort debrief] Another participant attributed reduced listening to end-of-session scarcity: “We were a bit overwhelmed... we stopped listening near the end when we saw we’d soon run out of cubes.” [Cohort debrief]. These statements describe reduced space for proposals at moments when the board state signaled imminent loss, especially through outbreaks and diminishing cubes.

Theme 3. Repair after late rule or role reminders

A rule requirement or a role capability became clear only after action had already started. One participant recalled delayed recognition of a role capability: “On the way, we realized: ‘No, wait... it was the Researcher, and she can take and give cards to everyone’.” [Table debrief] Another participant recalled a missed requirement for cure production: “We forgot the intermediate step, that the cure is made in a center.” [Cohort debrief]. In both excerpts, participants name the condition and then restate what the team needed to do next. The debrief contributions present the correction as part of restoring a shared plan after a late reminder.

Theme 4. Collective responsibility and decision control

Participants presented individual turns as actions carried out on behalf of the team. One participant said: “We were not acting individually, we were discussing... we understood that a member does not play for themselves... even if I play, it is the group that played with me.” [Table debrief] A similar point was made in a cohort contribution: “Even if someone played, it was the whole group playing.” [Cohort debrief] Participants also referred to progress in developing a cure as a shared

task that depended on resource transfer. One participant recalled: “I could give him my card and complete the four efficiently, and we managed to create the cure.” [Cohort debrief] Participants also recalled division of responsibility across members, including a recap in which “one person handled operational objectives in one area, another covered North and South America, and two of us focused on centers and cures.” [Table debrief]

Alongside these collective descriptions, some excerpts focused on narrowed decision control. One participant described an imposed action: “There was an imposition... she played without knowing what she had to do... it was imposed on her.” [Table debrief] Observer notes described a related configuration: “Two people decided while others placed cubes,” which “cut the team in two.” [Observer notes]

Theme 5. Sequencing and commitment under time limits

Participants described coordination in terms of putting actions in an order and committing within the time available. Several tables recalled early agreement on a strategy, followed by difficulty when outbreaks occurred. One team said: “We agreed on a strategy... create centers, make cures, and avoid new outbreaks,” then recalled the first cascade as having “degenerated in ten seconds,” followed by “a lot of time talking... each one thought their way was the right way.” [Table debrief]

During play, a team member stated ordered steps aloud as they checked roles and cards they held. While playing a participant asked: “What’s your role? What cards? First create a center here, then a cure, then disperse.” [Gameplay] In the table debrief, the other team recalled extended discussion without timely commitment: “We lost seven minutes just talking... who shouted the loudest?” [Table debrief]

Theme 6. Checking routines, rule uncertainty, and prioritization under pressure

Participants described repeated checking as a way to keep actions consistent with rules and with the team plan when the board state changed rapidly. One participant described “an imbalance in how the rules were mastered... people kept correcting each other, that takes time.” [Table debrief] During play, questions recurred about permitted actions and conditions, including: “Do we all have to be together to create a center?”, “Is ‘discard’ an action?”, and “Can the Researcher exchange at any time?” [Gameplay] One table later noted a rule error: “Our center there is wrong... luckily we didn’t use it.” [Table debrief]

Participants and facilitators also named explicit checking functions during reflection. One contribution defined “quality control” as checking “validity at the level of the rules and validity in relation to the strategy.” [Cohort debrief] Participants also described structured pauses used to reassess progress during action. A Cohort debrief extract described how a participant explained

this pause by another player in her team: “In the middle of action, she said, ‘No, wait, we need to see where we are.’”

Pressure from rapid board changes and competing demands also appeared in participant statements and facilitator observations. One participant described “a succession of four outbreaks” that “stopped the game abruptly” [Table debrief]. The facilitators observed instances where several players took to standing around the board, with speech becoming louder and more animated during discussion of cure completion near the end of the 40 minutes [Facilitator notes]. Participants also described a tension between immediate outbreak management and actions oriented to cure production. One participant said: “You run after the event... the event becomes only a symptom of the real problem. The real problem in the game was to have cures.” [Cohort debrief] Another participant recalled: “We focused more on creating cures and creating centers. We did not jointly manage epidemics, creating cures, and creating centers.” [Table debrief]

Cohort debrief contributions also articulated routines intended for reuse under these conditions. One participant described a shared standard for checking proposals against an agreed plan: “What allows you to know whether the decision is valid or not is its conformity with the strategy decided as a team. Is it the best action to continue the strategy?” [Cohort debrief] Another participant described a repeatable sequence before committing actions: “Our tactic was reflection before action. Each time, even if it is obvious, we think, we count, then we do our action.” [Cohort debrief]

Discussion

Specifying behavioral targets for One Health competencies

Effective One Health practice draws on four enabling functions: collaboration, communication, coordination, and capacity building (FAO et al., 2022). The seminar findings point to observable behaviors that may help define these functions in practice, especially where time pressure, limited resources, and shared decision-making shape action. Two behaviors recurred across the sessions. The first was stating intended actions aloud before carrying them out. The second was pausing during a sequence of actions to reassess how available resources should be allocated.

In this seminar, these behaviors, in the form of pauses, functioned as a collective checking routine before a decision was carried out. Participants stopped to test a proposed course of action against three concrete points: what the rules allowed, what options remained available at that stage of the game, and which objective the team was prioritizing given the current board state. This made coordination visible because participants had to state their understanding of the situation openly and align it with others before proceeding.

This reading is consistent with the literature on shared mental models, defined as a compatible understanding of the task and team roles that supports coordination (Mathieu et al., 2000). In the

seminar, this shared understanding was visible when participants referred to the same rules, the same resource constraints, and the same board conditions to justify a decision. Where excerpts showed early shared checks of this kind, participants described reaching decisions with less back-and-forth. Where such checks were described as sparse or late, participants recalled revisions after outbreaks and extended disagreement about the next action.

Friction and interdependence under pressure

Pressure in the game came from role differences, scarce resources, a time limit, and early uncertainty about how to play well. Role differences created dependence, since no single player held the abilities or card combinations needed to reach the win condition within the allotted rounds. That dependence became fragile when epidemic events changed the board quickly, since a sudden shift forced players to revise plans with little time to explain the revision. Participant statements linked these abrupt changes to weaker listening and tighter decision control by one or two voices during critical turns.

Decision concentration during critical turns narrows the range of proposals a team considers under pressure. For learners, surfacing this during the debrief discussion helps them recognize when a shift in the board has handed control to one or two members. Facilitators can address it through structured turn-taking during high-pressure sequences, rotation of the observer and decision roles, and a debrief prompt that asks who was speaking and who had gone quiet at the point of a cascade.

Cognitive narrowing refers to a stress-related tightening of attention onto fewer cues (Wickens, 2021). In the seminar, narrowed attention appeared when outbreak control used up available actions and pushed cure building into the background. That trade-off created a tension between stopping immediate spread and keeping progress towards the win condition (Figure 2). Teams who handled the tension used a pause to restate the board situation, assign the next actions by role, and then resume play with a revised step sequence. Pauses in clinical teams have been described as brief resets that support shared awareness during time-pressured coordination, and the same function is visible here through the way participants rebuilt a shared view before committing (Schmutz & Eppich, 2017).

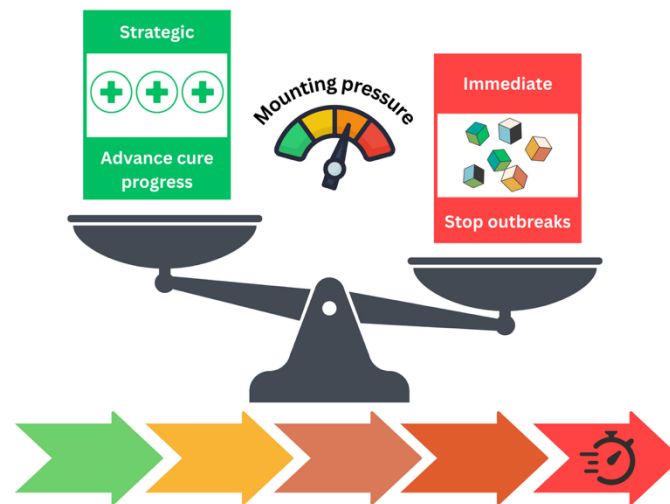


Figure 2. Competing demands under mounting pressure. During play, teams balanced two demands: advancing cure progress and stopping outbreaks. Role interdependence, resource scarcity, and abrupt board changes raised the pressure across the timed session, shown here by the gauge and the escalating arrow. The figure represents how immediate threats compete with slower cure progress as time runs down. The illustration was created in Canva.com

Structured reflection as a mechanism for capacity building

While situational awareness was restored during play, long-term retention relied on the reconstruction of these moments during structured reflection (Fanning & Gaba, 2007). The two-step reflection format allowed learners to transition from describing specific game events to articulating transferable principles with the help of the facilitator. Articulating these principles helped participants recognize coordination work that had remained tacit during the rapid execution of the task. Recognition of such work supports the labelling of interaction patterns, which aligns with the capacity building function of workforce development (OHHLEP et al., 2022).

Workforce development in this context relies on repeated cycles of performance and debriefing. Such cycles suggest that serious games provide a low-consequence environment where diverse practitioners can experiment with the friction of cooperation (Irabor et al., 2025). Experimenting with friction (role dependence, time scarcity, and rapid state change) may help prepare learners to recognize similar coordination pressures in operational One Health response, though the game environment lacks the political stakes of real-world implementation.

The candidate behaviors could support assessment in a practical form. Stating intended actions aloud, calling a pause to reassess allocation, and checking a proposal against the rules and the agreed strategy can be written as observable items for a debrief-anchored checklist or rubric, used

for formative feedback. Testing such assessment against learning outcomes is a direction for future work.

Scope and Limitations

The transferability of these findings is limited by the educational setting of a master's programme, where participants regarded game-based learning as a legitimate pedagogical tool. Its legitimacy among learners ensured high engagement, but environments characterized by skepticism towards games or limited facilitation capacity might lead to different teamwork dynamics. Additionally, the 40-minute play period offers a simplified view of essential teamwork features, omitting the longer timescales and competing priorities typical of cross-sector coordination. These games can highlight aspects that complex real-world settings often conceal, though they may also overlook the institutional inertia and resource competition inherent in One Health work.

The design does not separate the contribution of the One Health outbreak scenario from the teamwork demands common to any cooperative game under time pressure. The behaviors described here may arise in cooperative tasks without a One Health frame. However, the seminar did sit within a post-graduate One Health programme (Sidikou et al., 2021), participants met the task within that orientation, and the framing formed part of the setting in which they acted. The dataset does not establish whether participants linked their in-game behavior to broader One Health practice during play, and examining such links directly is a further direction.

Task simplification also risks obscuring the impact of game-specific variables. Card order ("card luck") is one such variable. Variation in card order meant some teams faced early cascades, while others built infrastructure under more stable conditions. This variation implies that game outcomes can reflect random draws alongside team capability. In the 2023 cohort, we reduced this source of variation by spacing epidemic cards at defined intervals in the pile as demanded by the original Pandemic game rules. Randomness nevertheless remained within and across rounds. Prior gaming experience may also have shaped how quickly teams formed shared routines during early turns. Additionally, the presence of facilitators and recording equipment may have shaped the social desirability of participant accounts during debriefing. Given these influences, we present our reading of the material as a hybrid deductive–inductive thematic analysis, keeping claims within the scope of the 2023 cohort dataset.

Conclusion

A reflexive thematic analysis of this dataset suggests that serious games that act as constrained shared tasks can help bridge the gap between abstract One Health competencies and candidate practitioner behaviors. Candidate behaviors identified in this study, such as explicit resequencing and team-level strategy checking, offer descriptions that training programmes might use for practice and assessment. Such training targets allow educators to move beyond broad domain

definitions toward the rehearsal of routines required under time pressure. While games cannot replicate full institutional complexity, they provide a safe setting for learners to encounter and name the coordination pressures that define cross-sector work.

Data availability

The datasets generated and analyzed during the current study are securely stored at the University of Liège. Due to privacy and ethical restrictions regarding the qualitative audio recordings and observational data of the participants, the data are not publicly available. However, they are available from the corresponding author upon reasonable request.

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