

Skeptical Tarot: an innovative strategy for teaching critical thinking in health: an experience report

Tarot Cético, uma proposta de estratégia inovadora no ensino do pensamento crítico em saúde: um relato de experiência

André Demambre Bacchi 

Universidade Federal de Rondonópolis (Rondonópolis). Mato Grosso, Brazil. bacchi@ufr.edu.br

ABSTRACT | INTRODUCTION: Critical thinking is essential for the training of health professionals, particularly in the context of misinformation and quackery. Traditional education, which is often theoretical, limits the practical application of knowledge. Active methodologies such as gamification have emerged as effective alternatives. This report describes the development and implementation of "Skeptical Tarot," a teaching tool designed to illustrate logical fallacies and cognitive biases in an engaging and practical manner. **OBJECTIVES:** To detail the experience of creating and using the "Skeptical Tarot" in epidemiology classes for medical students with the aim of enhancing critical thinking. **METHODS:** The tool was developed based on a review of fallacies and biases, resulting in illustrated cards featuring controversial characteristics and scenarios. The activity was conducted in two classes (80 students). Students were tasked with constructing fallacious arguments and participated in guided critical discussions, during which they analyzed and identified reasoning errors. **RESULTS AND DISCUSSION:** The "Skeptical Tarot" generated high levels of engagement and facilitated the comprehension of complex concepts. The presentations encouraged creativity and promoted in-depth reflection on the importance of ethical and evidence-based communication. However, limitations such as the qualitative nature of the evaluation and restricted application context indicate the need for broader, quantitative studies. **CONCLUSION:** "Skeptical Tarot" proved to be an innovative and promising strategy for teaching critical thinking, underscoring the value of active methodologies in health education. Future research should explore long-term effectiveness and adaptability to different contexts.

KEYWORDS: Critical Thinking. Gamification. Active Methodologies. Health Education. Logic. Ethics.

RESUMO | INTRODUÇÃO: O pensamento crítico é essencial na formação de profissionais de saúde, especialmente em um contexto de desinformação e charlatanismo. O ensino tradicional, muitas vezes teórico, limita a aplicação prática do conhecimento. Metodologias ativas, como a gamificação, surgem como alternativas eficazes. Este relato descreve o desenvolvimento e a aplicação do "Tarot Cético", uma ferramenta didática para ensinar falácias lógicas e vieses cognitivos de forma prática e envolvente. **OBJETIVOS:** Relatar a experiência da criação e do uso do "Tarot Cético" em aulas de epidemiologia para turmas de medicina, visando aprimorar o pensamento crítico. **METODOLOGIA:** A ferramenta foi desenvolvida com base em uma revisão sobre falácias e vieses, resultando em cartas ilustradas com personagens e cenários polêmicos. A atividade foi aplicada em duas turmas (80 estudantes). Os alunos elaboraram argumentos falaciosos e participaram de discussões críticas mediadas, analisando e identificando os erros de raciocínio. **RESULTADOS E DISCUSSÃO:** O "Tarot Cético" gerou alto engajamento e facilitou a compreensão de conceitos complexos. As apresentações estimularam a criatividade e promoveram reflexões aprofundadas sobre a importância de uma comunicação ética e baseada em evidências. No entanto, a avaliação qualitativa e o contexto limitado da aplicação são limitações que sugerem a necessidade de estudos amplos e quantitativos. **CONCLUSÃO:** O "Tarot Cético" demonstrou ser uma estratégia inovadora e promissora no ensino do pensamento crítico, destacando o valor das metodologias ativas na educação em saúde. Pesquisas futuras devem explorar sua eficácia a longo prazo e em diferentes contextos.

PALAVRAS-CHAVE: Pensamento Crítico. Gamificação. Metodologias Ativas. Educação em Saúde. Lógica. Ética.

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1. Introduction

The development of critical thinking is an essential component in the training of future health professionals, empowering them to assess information more judiciously and to make decisions based on scientific rationality. In an increasingly interconnected and digitalized world, the rapid spread of misinformation and the influence of persuasive yet scientifically weak discourses pose significant challenges to clinical practice and public health.¹ Consequently, the ability to identify logical fallacies and cognitive biases has become even more crucial not only to ensure the quality of patient care but also to strengthen scientific communication and the formulation of health policies.

Logical fallacies and cognitive biases are reasoning errors that can distort one's perception of reality and inappropriately influence decisions.² In the health sector, such errors may lead to the adoption of ineffective or harmful clinical practices as well as the propagation of false information. Charlatanism and scientific denialism exploit these flaws in reasoning and argumentation to disseminate misinformation, potentially resulting in significant adverse effects on both individual and public health.³

Traditionally, the teaching of these skills has been limited, and when it does occur, it tends to focus on theoretical approaches that, although important, often fail to effectively engage students or facilitate the practical application of the knowledge acquired.⁴ In this context, the use of active methodologies is an important alternative. These methodologies place the student at the center of the learning process, promoting the active construction of knowledge through practical and interactive experiences.⁵ This paradigm shift enhances engagement and improves both the retention and application of complex concepts, thus making learning more meaningful.⁶

Gamification has emerged as an effective strategy to encourage student participation and motivation. By incorporating game elements into educational contexts, gamification can transform learning activities into engaging and stimulating experiences, fostering interaction and collaboration.⁷ In the context of health education, gamification has been used to enhance understanding of complex concepts and develop essential critical skills.⁸ Furthermore, gamification offers significant potential to improve

the way health professionals acquire and apply new knowledge in a more engaging and rewarding manner than traditional approaches.⁹

The "Skeptical Tarot"¹⁰ is a didactic tool that seeks to integrate these premises using playful and visual elements to teach logical fallacies and cognitive biases in an innovative way. Inspired by the popular symbolism of the traditional tarot, the Skeptical Tarot subverts a practice originally rooted in beliefs, transforming it into an instrument to deconstruct unfounded beliefs and enhance critical thinking. The tool was designed to engage students creatively, facilitating an understanding of how fallacious arguments are structured and employed, particularly in health-related contexts.

Using stereotypical characters and controversial scenarios from the health field, the "Skeptical Tarot" aims to allow students to practically experience both the construction and deconstruction of fallacious arguments. This article reports on the development and implementation of the "Skeptical Tarot" tool in epidemiology classes for two cohorts of medical students at a public university. By incorporating an approach based on active methodologies, the objective was to provide students with rich and interactive educational experience, preparing them to face the challenges of scientific communication and clinical practice with a critical and ethical mindset.

The relevance of this initiative is aligned with the growing need to train health professionals to be capable of navigating a complex environment where inaccurate information can have serious consequences.¹¹ By equipping students to identify and refute fallacious arguments, we can promote the development of safer and more effective clinical practices, as well as the advancement and consolidation of public health policies. Furthermore, the development of critical thinking is essential for lifelong learning, an indispensable competency in fields that are constantly evolving, such as medicine.¹²

2. Objectives

The present experience report aimed to describe the process of creating and developing the gamebook "Skeptical Tarot", a didactic tool designed to facilitate the teaching of logical fallacies and cognitive biases in

the health context, and to report on the experience of its practical application in epidemiology classes for medical students at a public university.

3. Methods

This experience report is divided into two stages: the first involves the creation of the didactic tool, and the second involves its practical implementation in epidemiology classes using active methodologies to maximize student engagement and learning.

3.1 Development of the didactic tool

In the first stage, carried out between October 2022 and October 2023, a structured process underpinned by theoretical foundations was conducted to develop the "Skeptical Tarot". Initially, a comprehensive literature review of logical fallacies and cognitive biases was performed by consulting both classical and contemporary works in philosophy and psychology.¹³⁻¹⁵

Based on this theoretical framework, the main logical fallacies and cognitive biases to be addressed are selected and defined. Subsequently, a series of archetypal characters were developed to represent common stereotypes found in pseudoscientific and fallacious discussions, such as the "Self-help Guru," the "Conspiracy Theorist," and the "Denying Politician." These characters were designed to embody the behaviors and thought patterns that contribute to the spread of misinformation.

Concurrently, controversial scenarios within the health sector have been developed to serve as context for applying fallacies and biases. Examples include debates regarding vaccination, climate change, and reproductive planning. These scenarios were selected based on their current relevance and the potential to stimulate critical reflection.

The catalogued and created elements were transformed into cards visually inspired by traditional tarots, striving to balance the aesthetic and symbolic components to render the experience playful and engaging. Each card featured original illustrations and descriptions that facilitated understanding of the concept.

All materials were compiled into a textbook that provides a detailed explanation of the tool's usage and applications, titled *Skeptical Tarot: Rational Cartomancy*.¹⁰ The book is available for free download, promoting open access to the educational resources cited in this report [available at: <https://bit.ly/tarotcetico>].

3.2 Classroom implementation

The second stage involved the practical application of the "Skeptical Tarot" in Epidemiology classes at a public university during two separate academic semesters (March and October, 2024). Eighty medical students participated in the activity (two classes of 40 students each). The classes were held in person in classrooms equipped for group work and presentations. To ensure an interactive and collaborative approach, the students were organized into five groups per class, with approximately eight members each. Prior to the activity, a brief theoretical introduction of the importance of scientific thinking was provided, with an emphasis on logical fallacies and cognitive biases, reinforcing the significance of critical thinking in medical practice.

The cards created and available at the end of the book were printed by the instructor, and each group randomly received a set of cards containing:

1. *Archetypal character* (representing a specific stereotype in fallacious discussions)
2. *Three cards depicting fallacies or biases*; and
3. *One scenario card* (describing a controversial context in the health sector or related areas).

Moreover, the groups had access to the "Skeptical Tarot" book to clarify doubts and elucidate the meanings of the drawn cards. The assigned task for each group was to construct a convincing fallacious argument, incorporating the characteristics of the archetypal character and employing the selected fallacies and biases within the context of the scenario. The groups were free to choose the format of their presentations, with options including dramatizations, simulated debates, speeches, or other creative forms of expression.

3.2.1 Presentation dynamics

The presentations were conducted in a "masked" format, meaning that the other groups were not informed in advance of which fallacies and biases were being employed. This strategy aims to challenge peers to identify and critically analyze the reasoning errors present in the delivered arguments. After each presentation, a discussion session was led by the supervising instructor, during which students were encouraged to:

1. Identify the fallacies and biases used by the present group.
2. The impact of these reasoning errors within the context of the proposed scenario is analyzed.
3. Reflects on the ethical implications of employing fallacious arguments in professional practice.
4. Discuss strategies to combat misinformation and promote appropriate scientific communication in health.

This stage was considered fundamental for consolidating learning, allowing students to connect practical experience with the theoretical concepts discussed, as well as providing an opportunity to assess the educational impact through student engagement, quality of presentations, and development of critical thinking.

4. Results and discussion

The implementation of the "Skeptical Tarot" in epidemiology classes for medical students proved to be an interesting pedagogical strategy, with a visible impact on the exercise of critical thinking and understanding of logical fallacies and cognitive biases. The enthusiastic reception of the activity by students highlighted the potential of gamification and active methodologies as educational tools in the context of higher education in health.

The activity stimulated engagement and creativity among the students, who were able to practically experience how such reasoning errors were formulated and convincingly presented by constructing fallacious arguments based on the drawn cards. The use of archetypal characters and controversial scenarios transforms abstract

theoretical concepts into concrete, interactive, and playful experiences, facilitating the internalization of content.

During the "masked" presentations, students were challenged not only to create fallacious arguments, but also to identify and critically analyze those presented by their peers. This collaborative and investigative dynamic fostered in-depth discussions and collective reflections on the nature of the logical fallacies and cognitive biases. The students demonstrated both capacity and interest in recognizing and deconstructing such reasoning errors, evidencing an evolution in their critical thinking skills.

This activity also served as a catalyst for broader debates on the role of health professionals in contemporary society, particularly in combating quackery and scientific denialism. In a context marked by the proliferation of fake news and misinformation, particularly on social media, the ability to discern reliable information is essential.¹ The students reflected on how fallacious arguments can negatively influence clinical and public health decisions, reinforcing the need for ethical evidence-based scientific communication.

Furthermore, the use of an active methodology (as described in this experience report) aligned with current medical education guidelines emphasizes the importance of training professionals who are capable of lifelong learning, adaptability, and critical engagement.¹⁶ The adopted approach encouraged autonomy, responsibility for one's own learning, and teamwork skills, elements that are essential for contemporary medical practice.

Gamification introduces game elements that increase motivation and participation factors, which are often limited in passive learning approaches. The literature highlights that playful and interactive activities can improve knowledge retention and stimulate higher cognitive skills such as analysis, synthesis, and evaluation.⁷ Additionally, gamification can enhance learning, engagement, and cooperation; facilitate the application of theoretical concepts in realistic scenarios; improve time management and decision-making in the health field within a risk-free environment; and provide immediate feedback from the instructor.^{17,18}

This experience also highlighted the potential of the “Skeptical Tarot” to combat quackery and denialism by equipping future health professionals with tools to identify and refute pseudoscientific arguments. A deep understanding of logical fallacies and cognitive biases is fundamental for resisting discourses that, although persuasive, lack scientific grounding.¹⁴ By engaging in the construction of fallacious arguments, students become more aware of the rhetorical strategies employed in misinformation, thereby strengthening their ability to promote evidence-based practice.

Student feedback indicated an awareness of the importance of critical thinking and ethics in scientific communication as well as the potential to extend the application of the Skeptical Tarot to other educational contexts. Its adaptation to subjects such as medical ethics, health communication, and continuing education programs could enrich training at various levels. Furthermore, its use could be expanded to fields beyond medicine, such as social and human sciences, where critical thinking is equally valued.

Although the experience with “Skeptical Tarot” demonstrated positive results in student engagement and the development of critical thinking, it is important to acknowledge the limitations of this report. First, the evaluation of the educational impact was conducted in a qualitative and informal manner without the use of standardized instruments or quantitative metrics that could objectively measure the effectiveness of the tool. Furthermore, the activity was implemented in only two classes of medicine at a single institution, which may limit the generalizability of the results to other educational contexts or programs. It was also not possible to assess the long-term impact of the activity on students' academic performance or professional practice, as this was a one-time activity rather than a longitudinal one.

Reflecting on this experience highlights the need for future research that evaluates the impact of methodologies such as the “Skeptical Tarot” on the development of critical thinking and professional

practice in a quantitative, qualitative, and longitudinal manner. Studies employing validated instruments could provide more robust evidence regarding the efficacy of these approaches, thereby contributing to the improvement of academic curricula and the training of professionals who are better equipped to face current challenges.

In summary, experience with the “Skeptical Tarot” underscores the relevance of active methodologies and gamification in higher education, particularly in the teaching of health sciences. By innovatively integrating theory and practice, the activity fostered a unique learning environment that facilitated the exercise of the critical skills essential for professional practice. It is further emphasized that continued investment in pedagogical approaches that promote critical thinking and resilience against misinformation is vital, as it contributes to the formation of professionals committed to ethics and science.

5. Conclusion

Experience with the “Skeptical Tarot” proved to be an innovative and promising pedagogical strategy for teaching logical fallacies and cognitive biases to medical students. By integrating elements of gamification and active methodologies, the tool fostered high levels of student engagement and promoted the development of critical thinking in a practical and interactive manner. This report highlights the use of innovative tools as a strategy to facilitate the understanding and identification of fallacious arguments, thereby contributing to the training of critical professionals who are better prepared to confront the challenges of misinformation in the health sector. The activity encouraged deep reflections on the importance of ethical, evidence-based scientific communication, an essential aspect in combating scientific denialism and the spread of misinformation.

Moreover, the experience underscores the need to continue exploring and refining innovative pedagogical approaches that integrate theory and practice, thereby strengthening the essential skills required for responsible and ethical professional practice.

Competing interests

No financial, legal, or political conflicts involving third parties (government, companies, private foundations, etc.) have been declared for any aspect of the submitted work, including but not limited to grants and funding, participation in advisory boards, study design, manuscript preparation, statistical analysis, etc.

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