From Board Game to Digital Game: Prototyping and Transmediation of Screener

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Abstract. *This article describes the prototyping and transmediation of the educational game Screener to Digital Screener, aiming to deepen the teaching of the Drug Discovery and Development (DDD) process. Despite the success of Screener, Digital Screener broadens the scope by introducing timeline mechanics to teach the temporal sequence of DDD tasks. These initiatives highlight the potential of games as adaptable and versatile learning tools, reinforcing the application of playful methods in science education.*
Keywords. *Transmediation, Prototyping, Pharmacology*

Resumo. *Este artigo descreve a prototipação e transmediação do jogo educacional Screener para Digital Screener, com objetivo de aprofundar o ensino do processo de Descoberta e Desenvolvimento de Fármacos (DDF). Apesar do sucesso do Screener, o Digital Screener amplia o escopo, introduzindo mecânicas de timeline para ensinar a sequência temporal de tarefas do DDF. As iniciativas realçam o potencial dos jogos como ferramentas de aprendizado adaptáveis e versáteis, fortalecendo a aplicação de métodos lúdicos na educação científica.*
Palavras Chave. *Transmediação, Prototipação, Fármacos*

1. Introduction

This article describes the prototyping of the transmediation of the educational game Screener, which allowed the creation of Digital Screener, with the aim of expanding its potential audience. Screener [Noël et al. 2021] is a board game originally developed by a multidisciplinary team and positively evaluated by several postgraduate courses in Pharmacology and related areas, proposing a playful and interactive method of instructing in Drug Discovery and Development (DDD).

This new proposal maintains the original educational essence while introducing distinct gameplay elements and challenges. Digital Screener is not a direct adaptation of Screener, but rather an alternative project that proposes using timeline mechanics to teach the temporal sequence of DDD tasks. Through this digital game, players organize cards

that represent the DDD tasks chronologically, which encourages an understanding of the flow and logic behind the drug development process.

These proposals show the potential of games as learning tools and how they can be adapted and evolved to meet different educational needs and goals.

In this article, we adopt an ad hoc process to investigate the feasibility of a game composed of 3 basic steps: understanding the problem, conceptualization, and prototyping.

2. Transmediation and Procedural Rethorics

Transmediation refers to translating a narrative or concept from one medium to another [Suhor 1984], necessitating alterations and adaptations to accommodate the unique properties and constraints of each medium. This process is critical to maintaining the efficacy of content and user engagement across different platforms.

In the context of educational games, transmediation is a possible consequence of their development. Games often begin as one format, for instance, a board game, and may transition into other forms, like card games, video games, or mobile applications, due to their success, the interest in a broader audience, publishing costs, or other reasons. "Célula Adentro", for example, is a board game to teach concepts of cell biology that have been reimplemented in digital platforms due to the COVID-19 pandemic [da Silva 2023]. "Comenius" is a larger project that has 3 digital games, a card game, and an RPG[1], which can be understood as a large effort of transmedia development that includes transmediation [Pinheiro and Cruz 2022].

However, this transition is not necessarily a simple replication, but should be seen as an opportunity for a possible reinvention to cater to the differing characteristics of each medium.

Board games are physical and tactile experiences that are typically designed for multiple players and involve real-time interactions. On the contrary, digital games can be developed for single players and incorporate a variety of interactive elements such as animations, sounds, and intricate scenarios that cannot be reached in a physical game. However, digital formats may lack the tactile social element inherent in board games.

This is where the concept of procedural rhetoric comes into play. In game design, procedural rhetoric refers to how the rules and mechanics of a game can create meaning, teach, or persuade players. It is particularly relevant for educational games, as they use their mechanics to impart knowledge or skills [Bogost 2007].

Consequently, the need may arise to alter the game's mechanics during the transition from board games to digital games. These modifications not only aim to preserve the original educational objectives, but also enhance them, utilizing the unique features of the digital medium. Aiming for simpler digital games that can focus on one or a few educational goals can be a good strategy in transmediation. At the same time, (educational) digital game conception and development is a complex and risky process. To address these challenges, different processes have been proposed, reported, and discussed by both academia and industry [Kelly et al. 2007, Freitas et al. 2017, Siriaraya et al. 2018].

[1] https://gamecomenius.ufsc.br/

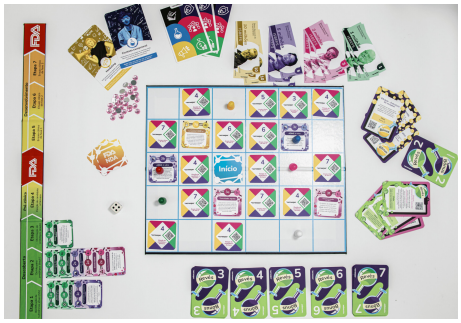

Figure 1. Screener ready to play. Photo by Lucas Gama

Therefore, transmediation is not a simplistic conversion, but a thoughtful transformation, using procedural rhetoric to respect the essence of the original content while maximizing the potential of the new medium to achieve educational objectives.

In addition, transmediation must consider both original and final resources, requirements, and constraints, both from the content and the media.

3. Screener

Although the use of games in educational methodologies is a prevalent trend, there are scarcely any tools designed to inform individuals about the drug discovery and development process (DDD). We conceived Screener, shown in Figure1 to address this, a scientific game that combines education, challenge, and engagement [Noël et al. 2021]. Its primary audience comprises post-graduate students in pharmacology, medicinal chemistry, pharmacy, and medicine. The game also presents utility for pharmaceutical industries and regulatory or patent bodies in training their workforce.

The game replicates the drug discovery and development journey, from target validation to drug registration with a regulatory agency. This process takes seven steps and is divided into 29 tasks.

Screener can be played by 1 to 6 players or groups of players. The main elements of the game are 29 task cards. They are distributed on a grid board, resembling a game of memory, face-down, and players must find and acquire them in the correct order under a budget constraint. When a player finds and buys the final card, the game ends, and the winner is the player who acquired more tasks.

The standard characteristics of games, such as decision making and challenge, are integral to the gameplay. In-depth details on tasks and technical terminology are accessible through QR codes, enhancing the educational dimension of the game.

Initial student testing has corroborated the efficacy and potential of this novel educational instrument.

4. Understanding the Problem and Conceptualization

Developing a digital version of Screener was an opportunity that appeared after the original game was already published and the development team had moved to another project. At this time, a new developer was available: an undergraduate student of Computer Science that desired to develop a game as a final graduating project.

At this point, it was decided that a digital version of Screener should not directly translate the original board game to a software version, since this could be efficiently done using tools such as Tabletop Simulator or other similar products.

Moreover, one of the most important things was that just one player could play a digital version of Screener on a smartphone.

After reidentifying the main goals of screener education, i.e. memorizing and understanding the meaning and order of the 29 tasks, we did an informal brainstorm on what to develop and decided to prototype a game based on the board game "Timeline".

It is important to note that we had yet to learn if a viable game was possible at that time because Timeline uses an indefinite space in a table.

4.1. Timeline

"Timeline" is a popular educational card game in which the objective is to place historical events or items on a timeline correctly. The game comes in many versions, each focusing on a different theme, such as inventions, discoveries, or historical events.

In the game, each card depicts an event or item on one side and the event's date or the item's creation on the other. At the beginning of the game, players are dealt a number of cards, with the date side hidden. The players then take turns placing a card from their hand in a row on the table. After placing the card, the player flips it over to reveal the date. If the card was placed correctly with the event on the card occurring after the previous card in the row and before the following one, the card stays in place. Otherwise, it is removed from the timeline. The first player to get rid of all their cards wins.

5. Prototyping

Prototyping is a critical part of the game development process, particularly in creating digital games [Gibson 2014]. It involves creating a simplified version of the game, which captures the game's core mechanics and allows the developers to explore the viability of the game's concept. Some reasons to prototype are testing game mechanics, concept evaluation, technical feasibility identification, improved communication, iterative improvement, and risk mitigation.

In the context of educational games, prototyping is especially important to ensure that the game not only entertains, but also effectively conveys the intended educational content. This process allows developers to refine the balance between fun and educational value, ensuring that the game is engaging while still meeting its learning objectives.

6. The Prototype

Our intention with prototyping was to test the game's mechanics, evaluate the concept, identify the technical feasibility, and mitigate risk. We also aim to understand if we are correctly conveying DDD concepts to the players, and this is currently being evaluated.

Unity was selected as the game engine for the project's development, predominantly due to the advantages it promotes. It is a versatile tool that allows easy access to an environment to test the game's functionality on devices and screens of different specifications and sizes, provides support for 2D graphics suitable for the game, and offers intuitive integration with Visual Studio Code.

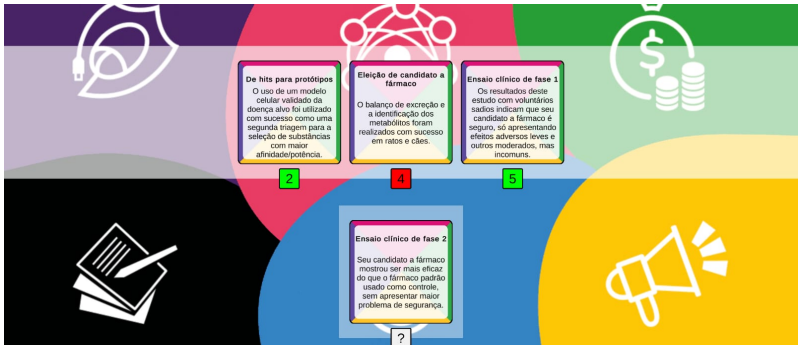

Figure 2. Digital Screener main screen. The first card is always provided by the game and considered correct. The player put two cards, one was correct (label in green), the other was put in the wrong position and the game corrected it (label in red). One card is waiting to be put in the correct position.

The prototype was developed for Android mobile devices. Android was selected partially for convenience, since it is the operating system used by the group in other projects.

In the prototype Digital Screener, shown in Figure 2, the stages of DDD process are represented by square cards, each containing a brief description of the stage it represents. A random task is selected to be the first on the timeline, and at every step, a new random task is selected for the player to position on the timeline. The player's goal is to arrange them chronologically, thus recreating the timeline of the process and consequently deepening the understanding of the methodology of drug development. The game does not discard a card put in the wrong position, as per the official rules of Timeline, but instead puts it in the correct position and counts it as an error. A player can make up to 3 errors.

Most of the effort for the prototype was to devise how to implement the timeline due to space constraints in smartphones. Using the current prototype showed that the proposed solution generated a smooth gameplay. There are still issues with the size of the card and its text; however, a new version will use a zooming function to help with that.

7. Conclusion

In this study, we have described the transmediation process for the educational game Screener, focusing specifically on the challenges associated with limited human resources and the need for a single-player compatible format with smartphones.

Through prototyping, we evaluated the potential for adopting Timeline game mechanics, acknowledging the inherent risks associated with the feasibility of this approach. The prototyping phase produced positive results, validating the viability of this approach and confirming its potential for further development.

With feedback on players' experiences, expectations, and suggestions obtained during the prototyping phase, we aim to refine Digital Screener, thus preparing it for an official launch on digital distribution platforms to disseminate and promote playful learning of the DDD process.

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