

# **SGDDEdu: A Model of Short Game Design Document for Digital Educational Games**

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## **Abstract**

*The use of games in education has become an increasingly present practice in contemporary society. For so-called "digital natives", learning through electronic games becomes more significant. Digital educational games are often seen as boring, non-motivational, that fail to bring in some essential elements that promote engagement, making the learning goal is not achieved either. Game Design is a game project. It describes how the game should be, defining its mechanics and interactions between player and the virtual world of the game and how they can affect the game environment. In order to document the design of a game, there is the Game Design Document (GDD), whose one of the main objectives, besides registration, is to help in communication between the different production teams of a game, allowing the game designer a broad view of that is being produced. However, because it is a large document that brings in detail all the main elements for the production of a game, it turns out to be little used, especially if the focus is the elaboration of small games, which are the majority of the digital educational games that exist. For these short games, which can often be worked out within a few hours, there are Short Game Design Document (SGDD). The SGDD, unlike GDD, will describe the elements of the game in a simplified way possible, whereas the game to be drawn from it is also a simple game. Thus, the proposal of this work is to elaborate a model of SGDD for educational games (the SGDDEdu), specifying elements of art, sound, mechanics and game programming, as well as educational elements in accordance with the new BNCC (National Curricular Common Base) of Elementary School, so that there is a*

*standardization and better categorization of educational games aligned with the proposed pedagogical objectives and the skills and competences described in each level of education. This work will be developed from the study and analysis of some models of already existing SGDD and the BNCC of Elementary School in general, causing in SGDD Edu. The research will be applied with teachers and educators requesting that they specify an educational game in the SGDD Edu template. With this, we intend to verify if the SGDD Edu has relevance and if it facilitates in the production of digital educational games, providing the teaching and learning process through the games, as well as trying to identify how the NCCB can contribute in the development of educational games.*

**Keywords:** Educational games, Game Design, SGDD, BNCC

## 1. Introduction

The use of games in education has become an increasingly present practice in contemporary society. For so-called "digital natives" learning through electronic games becomes more meaningful, through tangential learning [1].

Digital educational games, still timid, are present in educational institutions and show a new society that believes in the efficiency of games for the teaching and learning process, but still needs to have a greater connection with the school curriculum. The use of these games in the teaching and learning process favors the dynamism and stimulates the interest of the students, however, one of the main challenges of this practice is to align the game with the didactic content without losing the playfulness and learning objective to be reached [2].

Educational games are often seen as boring games because, for the most part, they lack the essential elements used in the development of digital games, such as the aesthetics, the dynamics and the mechanics. In addition, they do not have elements that promote engagement: plot, goals and objectives, difficulty levels, scores, rankings and feedbacks [3], making the learning objective of the game is not reached.

Game Design is the design of a game. It describes how the game should be, defining its mechanics and the interactions between the player and the virtual world of the game and how they can affect the game environment and the player [4]. In the game development process, it is necessary to document everything that should be done. This documentation is given through the Game Design Document (GDD), whose main objective is to help in communication between the different production teams of the game, allowing the game designer a broad view of what is being produced. The GDD is a "reference document, which development team members should consult frequently" [1] (p. 88) and which contains all the information about the game to be developed, from its initial design to its techniques and functionalities, described in detail.

Despite the importance of GDD in the development of a game, it is rarely used because it is a very large document, which contains many pages, sometimes becoming difficult to consult. The way of documenting a game should be thought out according to the type of game being developed. Due to this, there is the SGDD (Short Game Design Document), which is a type of document that describes the elements of the game in a simplified way, whose main elements to be described are: the history of the game, the

programming and the visual and sound artistic elements. Because of its simplicity in the description, the SGDDs are more used to document short games.

The proposal of this article is to elaborate a model of SGDD for educational games (SGDDEdu), in which besides being specified elements of art, sound, mechanics, game programming and plot, the pedagogical elements in accordance with the new BNCC (National Curricular Common Base) of Brazil will also be specified, for the purpose of standardization and better categorization of educational games aligned with the proposed pedagogical objectives and the skills and competences described in each level or year of teaching.

## **2. Theoretical Basis**

### ***2.1 Digital Educational Games***

Regarding technological tools, the use of digital games in education stands out as an imminent and potent contribution to teaching. Through games, students feel more motivated and engaged in the teaching and learning process. According to [5], because there are many theoretical concepts and school contents without a methodology more directed to a playful learning, students' assimilation and learning becomes difficult and tedious.

For [6], the teaching of digital games as a means for the student's learning process offers advantages such as playfulness, cooperation, participation, pleasure and motivation. And because of the great acceptance of this type of tool, mainly by the young public, the adoption of the games in the educational area represents a natural process [7]. The focus is on an effective learning model which should make possible the representation and elaboration of digital games as a viable educational technology.

The main objective of a good educational game is to teach the player while having fun with the game, and for that to happen, it is necessary for the student-player to feel interested and motivated to play. Thus, "the choice of an Educative (or Educational) Game should consider its content, but without forgetting the way it presents itself to the student-player" [8] (p. 839).

Nowadays, there is still a certain challenge for the use of educational games, no longer related to their ability to teach, but often due to the lack of mastery by teachers, as well as the lack of educational games that can integrate the learning objectives to be achieved with the engaging, motivating and playful feature of the game [9].

Besides educational games should be strictly related to the pedagogical goals to be achieved, it is also important that the game has one or more Learning Theories that base its conception. In the context of this work, we consider the following Pedagogical Theories: Innated-maturational of Binet and Gesell, Behaviorist of Watson and Skinner, Genetic Epistemology (Constructivism) of Piaget, Cultural-historical (Sociocultural) of Vygotsky and, finally, Meaningful Learning of Ausubel.

### ***2.2 Game Design***

In order for the goal of instruction to be successfully achieved, in addition to the game having to bring didactic elements, it must also bring elements inherent in the digital games that make the student feel motivated to play (and learn), which are related to mechanics, dynamics and aesthetics of the game, such

as: rules, points, rewards, gameplay, layout, game strategies, interaction with the game environment and with other players, time, risk and punishments [4].

These elements are closely related to Game Design. Thus, game design is the activity that defines the interaction of the player with the virtual world of the game, the actions that the player can perform, how they affect the game environment and how they are presented to the player [4]. According to [10] game design is a set of rules in which there is the means and motivation to play, creating a combination of challenge, competition and interaction, that is, elements that build fun by the game.

On the role of game designer, [4] further says that it can be developed by anyone who can make the decisions that define how the game should be, not needing a very thorough knowledge about it, just "one understanding of the principles of game design" (p. xxv). This opens the door to the insertion of digital educational games, since it allows the teacher himself to be the designer of a game that best meets the educational needs required.

One of the initial stages in the conception of the game idea and in the developing digital games is the development of a Game Design Document (GDD). In GDD should be described all the planning of the game, from the plot to the more technical features. According to [11] the GDD is the "floor plan layout" of a digital game, containing all its structural and functional description. The main function of GDD is to facilitate communication between teams, so this document should contain every detail of the game to be developed, helping to keep the project overview in a solid and coherent way, in addition to having all the planning documentation, making it possible to be consulted at any time. By thoroughly portraying the game in its entirety, GDD often becomes a very lengthy document and difficult to read. However, there is no specific template for writing a Game Design Document. Each game and each team has different needs and specificities. The document should be appropriate to the project and not the other way around.

### **2.3 BNCC (National Curricular Common Base)**

For the purpose of giving pedagogical bases to the model of SGDD to be proposed, the BNCC (National Curricular Common Base of Brazil) was chosen because it is a current document of reference that establishes the set of fundamental and indispensable learning for students of Basic Education.

From the BNCC, all educational institutions, whether public or private, have compulsory guidelines and recommendations for the elaboration and adaptation of their curriculum and pedagogical proposals for the teaching and learning process [12], making an articulated and integrated education policy with all the community, which was thought, elaborated and approved by pedagogical professionals, teachers and educators of all Brazilian society.

The BNCC defines the essential learnings that students must have from the development of ten general competences that corroborate with the learning and development rights in the pedagogical scope. For BNCC, competence is "the mobilization of knowledge (concepts and procedures), skills (practical, cognitive and social-emotional), attitudes and values to solve complex demands of daily life, the full exercise of citizenship and the world of work" [12] (p. 8). That is, from the competences, education raises values and actions that collaborate so that the society becoming more just, human and that preserves the nature and the social environment where it is inserted, being aligned as much with the Notebook of

Education in Human Rights [13], as with the 2030 Agenda of the United Nations (UN) [14].

In addition to the general competences, the BNCC is structured to specify the specific competences that the students must develop throughout the Basic Education. This work will use only the Elementary School as a reference for the elaboration of the SGDD model for Educational Games, in this way, the BNCC of Elementary School is a key piece for the development of the proposal.

Figure 1 exemplifies the organization of BNCC. In it, one has the Mathematical Knowledge Area of Elementary School. This area has only one curricular component: Mathematics. Each elementary school curriculum component is also divided into Initial Years (1st to 5th year) and Final Years (6th to 9th grade), with their levels of education. Figure 1 shows some of the thematic units, objects of knowledge and skills related to the curricular component of Mathematics of the 9th grade.

**MATEMÁTICA - 9º ANO**

UNIDADES TEMÁTICAS	OBJETOS DE CONHECIMENTO	HABILIDADES
<b>Números</b>	Necessidade dos números reais para medir qualquer segmento de reta Números irracionais: reconhecimento e localização de alguns na reta numérica	(EF09MA01) Reconhecer que, uma vez fixada uma unidade de comprimento, existem segmentos de reta cujo comprimento não é expresso por número racional (como as medidas de diagonais de um polígono e alturas de um triângulo, quando se toma a medida de cada lado como unidade). (EF09MA02) Reconhecer um número irracional como um número real cuja representação decimal é infinita e não periódica, e estimar a localização de alguns deles na reta numérica.
	Potências com expoentes negativos e fracionários	(EF09MA03) Efetuar cálculos com números reais, inclusive potências com expoentes fracionários.
	Números reais: notação científica e problemas	(EF09MA04) Resolver e elaborar problemas com números reais, inclusive em notação científica, envolvendo diferentes operações.
	Porcentagens: problemas que envolvem cálculo de percentuais sucessivos	(EF09MA05) Resolver e elaborar problemas que envolvam porcentagens, com a ideia de aplicação de percentuais sucessivos e a determinação das taxas percentuais, preferencialmente com o uso de tecnologias digitais, no contexto da educação financeira.
<b>Álgebra</b>	Funções: representações numérica, algébrica e gráfica	(EF09MA06) Compreender as funções como relações de dependência unívoca entre duas variáveis e suas representações numérica, algébrica e gráfica e utilizar esse conceito para analisar situações que envolvam relações funcionais entre duas variáveis.
	Razão entre grandezas de espécies diferentes	(EF09MA07) Resolver problemas que envolvam a razão entre duas grandezas de espécies diferentes, como velocidade e densidade demográfica.
	Grandezas diretamente proporcionais e grandezas inversamente proporcionais	(EF09MA08) Resolver e elaborar problemas que envolvam relações de proporcionalidade direta e inversa entre duas ou mais grandezas, inclusive escalas, divisão em partes proporcionais e taxa de variação, em contextos socioculturais, ambientais e de outras áreas.
	Expressões algébricas: fatoração e produtos notáveis Resolução de equações polinomiais do 2º grau por meio de fatorações	(EF09MA09) Compreender os processos de fatoração de expressões algébricas, com base em suas relações com os produtos notáveis, para resolver e elaborar problemas que possam ser representados por equações polinomiais do 2º grau.

Figure 1. Thematic Units, Knowledge Objects and Skills - Mathematics of Elementary School - 9th Year.

### 3. Related Work

#### 3.1 Short game design document (SGDD): Game design document applied to small games and advergames: A case study of the advergame Rockergirl Bikeway

In the work of [15], the authors demonstrate the application of a short game design document as a theoretical-textual tool with characteristics of a GDD for the production process of a small game or advergame.

For such a proposal, the authors relied on the ideas of Rollings and Morris [15] who says that a game design document should be able to describe the game as loyalty so that it can be "played mentally", that is, a document that when is read can create a mental image of the game.

In order to create a short game design document, [15] defined a few steps: 1) Description in a synthetic way the plot of the game; 2) Description of the whole game in a running text; 3) Text marking (with color, bold, italic, etc.) of art, interface, music and mechanics contents; 4) Creation of lists containing the elements

of art, interface, music and programming; 5) Description, in the form of drawings, the level game design (game flow chart), if necessary. With this, the SGDD would consist of basically two main pages: literal description of the game and lists of assets and programming routines of the game.

With a proposal to create a document that is short and easily accessible by all small game planning and development team (SGDD), the authors differed from the long and exhaustive GDDs. However, their proposal also distances itself from the educational scope, in which, at no time was mentioned the possibility of application in educational games, turning to commercial games as well.

The proposal of this article is strongly based on the ideas of [15], however, besides taking into account aspects of art, interface, music and programming, the pedagogical character of an educational game will also be explored and defined based on the BNCC.

### ***3.2 Creating a conceptual model for Game Design Documentation***

In this work, the authors [16] develop a way of documenting the idea of the game designer in order to facilitate the communicative process among the teams involved in the production of digital games, whether they of small or large size, attending to the greater variety of games that may exist.

In Chapter 3 of this paper, the authors listed and described the most important elements of a GDD according to a research carried out by [16] and, from these important elements of the GDD, they also defined the essential elements of the GDD. For [16], there are four essential elements that form a game: aesthetics, mechanics, history and technology, named by him as "Elementary Tetrad". The authors considered it possible to adapt elementary tetrad by removing one element, technology, transforming it into an "Elementary Triad", where aesthetics becomes the most visible element and mechanics and history are the least visible elements in the game. After this adaptation, the authors distributed some common elements present in most GDD models among the three elements of the triad. Some other common elements were not possible to fit the triad, causing the authors to define a new category called Add-ons.

In this work it was possible to verify that, although the authors wish to create a GDD model that attends to the greater number of types of games, the proposed model does not meet the requirements of a digital educational game because it does not provide space for the definition of elements related to the pedagogical content, being more oriented to commercial games or Indies games.

### ***3.3 PlayEduc: a conceptual framework for developing digital educational games***

The master's thesis defended by [17] proposes a conceptual framework for the development of digital educational games: called PlayEduc. The framework is based on the areas of psychology, pedagogy and design and uses some essential elements of each of these areas to guide the process of building games that combine entertainment with education.

In chapter 5 of [17], the author will present the proposed framework: PlayEduc, which aims to assist in the process of producing digital educational games and help fill the gap in the lack of reasoning and orientation among the teams of development of digital educational games.

PlayEduc is part of the pre-production stage of the game, in which the fundamental principles of the game (entertainment, learning and gameplay) related to psychology, pedagogy and game design are defined, each

containing 7 essential elements, that “are the extract of the fundamental principles and the fuel for development teams to evolve in the design of the game through the use of the framework” [17] (p. 69), which are described throughout the dissertation. At first, three questionnaires, one for each principle, will be used to guide the use of the framework. From what is answered in each questionnaire, one arrives at the GDD, which in the context of [17] is called EGDD (Educational Game Design Document), which "will gather all the information obtained through the application of the essential elements, besides counting other technical data fundamental to the process of development of the game" [17] (p. 79). Once the EGDD is built, the development of the game follows the flow to the next steps: Production, Execution and Evaluation. According to the author, PlayEduc has positively impacted the definition of the mechanics and the educational and psychological aspects of the developed games. In fact, the framework seems to guide the production team better. On the other hand, the product generated by the framework: the EGDD, is a robust and “dynamic document that can of course be updated during the other steps, either by increasing, changing or eliminating information in the document” [17] (p. 80, 81), which can become a long process until one reaches a final version of the document. This EGDD goes against the proposal of this paper, which is to suggest a short and quick document.

### 3.4 Comparison between works

In view of what has been presented in these three works, one can get the following table (Table 1) with some common characteristics (type of proposal of game design documentation, document size and presence or absence of educational and design aspects) and differentials of each of them, comparing them with the proposal of this article: the SGDDedu.

Table 1. Comparison of related work

	[15]	[16]	[17]
<b>Proposal</b>	SGDD	GDD	GDD
<b>Size</b>	Small	Long	Long
<b>Educational Aspects</b>	Absent	Absent	Present
<b>Design Aspects</b>	Present	Present	Present
<b>Differentials</b>	- Small document and easily accessible by development teams.	- Proposes an "Elementary Triad" for game design document.	- It involves psychological, pedagogical and game design aspects;  - GDD specific for the development of digital educational games.

Regarding the proposed documentation, the proposals of [16] and [17] bring the GDD model in the most common way and, therefore, these two proposals have the GDD as an extensive document. The work of [15] is the only one to adopt a short document model. Only in the work of [17] the educational aspects are mentioned and taken into account, since it is the only one that proposes a specific documentation model

for digital educational games, called EGDD.

In any case, each of the three papers has its differentials that contribute in some way to the validation of its proposals, as they were listed in Table 1.

The SGDDedu, proposed in this article, distinguishes itself from the others because it is a short game design document (SGDD) destined to short digital educational games, which brings design aspects and educational aspects, taking as a differential the use of BNCC as pedagogical basis.

#### **4. SGDDedu**

In order to help teachers or educators in the task of choosing and using a game that brings benefits to the students, and in view of all the theoretical foundations brought throughout this work, a Short Game Design Document (SGDD) model is proposed for the elaboration of digital educational games in accordance with the National Curricular Common Base (BNCC), taking into account the competences and abilities and with the principles of Game Design, becoming an engaging game that reaches the proposed pedagogical objectives. This model will be called SGDDedu.

SGDDedu is a short game design document specifically for educational games. It was elaborated from the model proposed by [15]. In addition to specifying the elements of art, sound, mechanics, game programming and plot [15], the pedagogical elements will also be defined according to the BNCC of Elementary School, with the purpose of standardization and better categorization of educational games in line with the proposed pedagogical objectives and the skills and competences described in each level or year of teaching.

The great differential of this document model is the "Educational" category that will specify the pedagogical theories that guide the game and the general and specific skills and abilities, according to the BNCC, that the student must attain while playing. The idea is that the teacher, or educator, or education enthusiast can design a digital educational game that best meets their real pedagogical needs.

In the next section it will be better explained how the structure of SGDDedu is given, showing a prototype of this document.

##### **4.1 The SGDDedu in practice**

The SGDDedu below (Figure 2) was elaborated by Reverse Engineering, in which from a final product, one can arrive at how it may have been elaborated [18]. The game Travessia, prepared by a group of students, is already finished, and from it was created the SGDDedu model in the proposed form. The model present in Figure 2 is also found in Appendix 1 for better visualization.



**TRAVESSIA**  
SGDDEdu by Raiane Martins

**Componente Curricular e Nivel de Ensino:**  
Ciências – 8º ano do EF

**Teoria(s) Pedagógica(s):**  
Behaviorista e Aprendizagem Significativa

**Contexto do Jogo:**  
TRAVESSIA é um jogo educacional que tem por objetivos abordar assuntos de ciências do 8º ano do ensino fundamental, discutindo especificamente aspectos de gênero cromossômico e sistemas reprodutores feminino e masculino, trazendo também aspectos transdisciplinares sobre Educação em Sexualidade. O personagem principal "Min" é caracterizado como um ser andrógino e é quem vai direcionar o jogo para abordar os aspectos ditos anteriormente. O Min conta com a ajuda do "Super Biscoito" para conseguir atingir os objetivos do jogo e combater o "Senhor Preconceito", que é o vilão do jogo.

**Descrição do Jogo:**  
O jogo é composto por um cenário central e dois minijogos. Começa o jogo com uma tela de **loading**. Em **segunda** começa uma **vinheta** de introdução com os **personagens** e **música de fundo**, logo após uma **tela inicial** a qual é composta pelos **botões** "início" e "ajuda" **[som: clicar]**.  **clicando** em "início", surge um **cenário central** com o Min e uma **fala micta na tela** **[som: fala]**. Ele deve **percorrer** o cenário, através das setas de orientação do teclado, até encontrar o Super Biscoito para orientá-lo para o primeiro minijogo **[música de fundo ambiente]**. Ao encontra-lo **micta-se** um **diálogo na tela** entre os dois **[som: diálogo]**. O objetivo pedagógico do minijogo1 é sobre os **sistemas reprodutores feminino e masculino**. Nesse primeiro minijogo, o jogador deve dizer quais são os órgãos que fazem parte dos dois sistemas reprodutores. Ao **entra** no minijogo 1 **[música de fundo 1]**, aparece uma **imagem** com o sistema reprodutor feminino e **quadros** com os nomes dos principais órgãos, onde o jogador precisa **relacionar corretamente** cada um, **arrastando** o nome ao **espaço** especificado. Ao acertar, é emitido um **som de acerto** e **aparece** uma **descrição na tela** do órgão, para que serve e uma curiosidade sobre ele. Isso se **repete** a cada acerto. Se a relação não estiver correta, é emitido um **som de erro** e não acontece nada. Ao concluir, aparece uma **imagem** do sistema reprodutor masculino, onde o jogador deve proceder da mesma forma que a anterior. Ao fim, **voltar** para o **cenário central**.  
Novamente o Min precisa **percorrer** o cenário para achar o Super Biscoito. Dessa vez o Super Biscoito está acompanhado do amigo do Min e do Senhor Preconceito. **Há** um **diálogo na tela** entre os personagens **[som: diálogo]** e em **segunda** é direcionado para o minijogo 2 **[música de fundo 2]**. O minijogo 2 é um jogo da memória, em que o objetivo pedagógico é conhecer e identificar as **identidades de gêneros existentes**. O jogador deve **relacionar** o símbolo do gênero à sua descrição. São **18 cartas** ao todo, 9 com **símbolos** e 9 com suas **descrições**. Ao **clicar** em cada carta **[som: clicar]**, ela **vira** revelando o que há nela. Se a relação estiver correta há um **som de acerto** e as duas cartas **somem** da tela. Se estiver errada, as duas cartas **desviam-se** novamente. Após acertar todas as cartas, o jogo é **redirecionado** para o **cenário central** e o jogo é **finalizado**.

Arte	Áudio									
<ul style="list-style-type: none"> <li>[ ] Personagens do jogo (Min, Super Biscoito, Amigo do Min e Senhor Preconceito);</li> <li>[ ] Vinheta de introdução;</li> <li>[ ] Tela inicial com botões de "início" e "ajuda";</li> <li>[ ] Interface: controles;</li> <li>[ ] Tileset: Cenário central (rua);</li> <li>[ ] Tileset #1: casas;</li> <li>[ ] Tileset #2: praça</li> <li>[ ] Tileset #3: lago</li> <li>[ ] Props #1: arvore, moita;</li> <li>[ ] Props #2: cerca, poste</li> <li>[ ] Animação: Min caminhando;</li> <li>[ ] Animação: Super Biscoito, Amigo do Min e Senhor Preconceito respirando;</li> <li>[ ] Interface: Caixas de diálogos na tela;</li> <li>[ ] Imagens dos sistemas reprodutores feminino e masculino;</li> <li>[ ] Interface: Quadros com nomes dos órgãos;</li> <li>[ ] Interface: Espaço para colocar os quadros com os nomes dos órgãos;</li> <li>[ ] Interface: Cartas do jogo da memória;</li> <li>[ ] Interface #1: Símbolos dos gêneros;</li> <li>[ ] Interface #2:Descrições dos gêneros.</li> </ul>	<ul style="list-style-type: none"> <li>[ ] Música da vinheta de introdução;</li> <li>[ ] Som: clicar;</li> <li>[ ] Som: fala;</li> <li>[ ] Música de fundo ambiente (cenário central);</li> <li>[ ] Som: diálogo;</li> <li>[ ] Som: acerto;</li> <li>[ ] Som: erro</li> <li>[ ] 2 Músicas de fundo para minijogos</li> </ul>									
	<b>Programação</b>									
	<ul style="list-style-type: none"> <li>[ ] Loading;</li> <li>[ ] Tela inicial com botões;</li> <li>[ ] Min seguindo a tela;</li> <li>[ ] Câmera seguindo personagem;</li> <li>[ ] Comandos de movimento pelo cenário através das setas de orientação do teclado;</li> <li>[ ] Diálogos;</li> <li>[ ] Transição do cenário central para os minijogos e vice-versa;</li> <li>[ ] Verificação da relação (correta ou incorreta) entre os nomes dos órgão e a imagem do sistema reprodutor;</li> <li>[ ] Arraste de quadros dos nomes dos órgãos através do mouse;</li> <li>[ ] Vira, desvira e desaparecimento de cartas;</li> <li>[ ] Verificação da relação entre os pares de cartas.</li> </ul>									
<b>Objetivo Pedagógico alinhado com a BNCC</b>										
<b>Ciências – 8º Ano EF</b>										
<ul style="list-style-type: none"> <li>[ ] Reconhecer os órgãos dos sistemas reprodutores feminino e masculino humano e suas funções (EF08CI11);</li> <li>[ ] Conhecer e Identificar algumas identidades de gênero existentes (EF08CI11).</li> </ul>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #9932CC; color: white;">Unidade Temática</th> <th style="background-color: #9932CC; color: white;">Objetos de Conhecimento</th> <th style="background-color: #9932CC; color: white;">Habilidades</th> </tr> </thead> <tbody> <tr> <td style="background-color: #FFF9C4;">Vida e Evolução</td> <td style="background-color: #FFF9C4;">- Mecanismos Reprodutivos</td> <td style="background-color: #FFF9C4;">(EF08CI11) Selecionar argumentos que evidenciem as múltiplas dimensões da sexualidade humana (biológica, sociocultural, afetiva e ética)</td> </tr> <tr> <td style="background-color: #FFF9C4;"></td> <td style="background-color: #FFF9C4;">- Sexualidade</td> <td style="background-color: #FFF9C4;"></td> </tr> </tbody> </table>	Unidade Temática	Objetos de Conhecimento	Habilidades	Vida e Evolução	- Mecanismos Reprodutivos	(EF08CI11) Selecionar argumentos que evidenciem as múltiplas dimensões da sexualidade humana (biológica, sociocultural, afetiva e ética)		- Sexualidade	
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	- Sexualidade									

Figure 2. SGDDEdu of the game "Travessia"

Fonte: Autoria própria.

Following the steps proposed by [15], but differentiating by adding information related to education, on the first page are the title of the game and the authorship, the curricular component and the level of education for which the game is intended, the pedagogical theories that base the conception of the game, the context of the game, containing information about what is the game, type of game, goals, themes covered, characters and the plot synthetically. Below is the description of the game in a more detailed way, describing the operation of each stage of the game and character characteristics, scenarios, sounds and pedagogical objectives. At the end of this description, markings were made in different colors to differentiate the elements related to the game's programming (mechanics), art and audio elements (design) and the pedagogical objectives present.

The second page of SGDDEdu is composed of four tables: the first three lists the elements of art/interface, music/sounds and programming that should be elaborated for the game; the fourth table is related to the pedagogical objectives of the game with skills and abilities according to the BNCC. In the first column of the table concerning the educational part are the pedagogical objectives that must be present in the game, in the second column, subdivided into three more columns, is the part related to the BNCC, containing the Curricular Component and the Level of Education (in this case, Science - 8th year of Elementary School), the Thematic Unit, Knowledge Objects and Skills, all related to the pedagogical objectives of the game. Skills are identified by a code defined by BNCC (in this case, skill EF08CI11 has been contemplated). As future works, the idea is to create an electronic editor in which the game designer (or teacher, or educator) can write their SGDDEdu according to predefined fields and make this document available so that

programmers and developers can create the requested game through of a Collaborative System of Development of Educational Games.

## 5. Conclusion

The student of the 21st century strives for an education that is more in keeping with the reality in which it is inserted. A more meaningful learning that engages you in the teaching and learning process.

The Digital Educational Games has become a tool used to attract attention and motivation to studies and appear as a great facilitator of the teaching and learning process, capable of integrating different resources and media in order to promote greater engagement and better results. However, the development process of these games can become complicated due to the long time, high financial costs and lack of knowledge, as well as the little resource and importance given to this game genre. In addition, they demand constant changes in the way of thinking about education, both by the institution and teachers, as well as by students. For the purpose of making the teaching and learning process more relevant to all actors (school, teachers, students and community), this paper intends to make this connection through digital educational games, in the form of a document that specifies in a simple way a game that can meet the real needs of the teacher and the student.

The SGDDedu was thought of as a reference model for the specification and documentation of digital educational games, both for bringing pedagogical elements from the BNCC and for facilitating the planning and design of a simple educational game that can be elaborated by any teacher/educator, reducing the lack of digital educational games that meet both the pedagogical objectives that are intended to achieve and the premises that promote the engagement related to the areas of Game Design.

From the application of the SGDDedu, it is intended to identify how, in fact, the BNCC, since it is a common national basis that defines the necessary learning at all levels of education, can contribute to the development of digital educational games and also verify if the SGDDedu has relevance for the production of these games, providing the teaching and learning process.

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## Appendix

### Appendix 1. SGDDedu Travessia

#### TRAVESSIA

SGDDedu by Raiane Martins

**Componente Curricular e Nível de Ensino:**  
Ciências – 8º ano do EF

**Teoria(s) Pedagógica(s):**  
Behaviorista e Aprendizagem Significativa

#### Contexto do Jogo:

TRAVESSIA é um jogo educacional que tem por objetivos abordar assuntos de ciências do 8º ano do ensino fundamental, discutindo especificamente aspectos de gênero cromossômico e sistemas reprodutores feminino e masculino, trazendo também aspectos transdisciplinares sobre Educação em Sexualidade. O personagem principal “Min” é caracterizado como um ser andrógino e é quem vai direcionar o jogo para abordar os aspectos ditos anteriormente. O Min conta com a ajuda do “Super Biscoito” para conseguir atingir os objetivos do jogo e combater o “Senhor Preconceito”, que é o vilão do jogo.

#### Descrição do Jogo:

O jogo é composto por um cenário central e dois minijogos. Começa o jogo com uma tela de **loading**. Em **seguida** começa uma **vinheta** de introdução com os **personagens** e **música de fundo**. **Logo após** uma **tela inicial** a qual é composta pelos **botões** “início” e “ajuda” [som: clicar]. **Clicando** em “início”, surge um **cenário central** com o Min e uma **fala inicial na tela** [som: fala]. Ele deve **percorrer** o cenário, através das setas de orientação do teclado, até encontrar o Super Biscoito para orientá-lo para o primeiro minijogo [música de fundo ambiente]. Ao encontrá-lo **inicia-se** um **diálogo na tela** entre os dois [som: diálogo]. O objetivo pedagógico do minijogo1 é sobre os **sistemas reprodutores feminino e masculino**. Nesse primeiro minijogo, o jogador deve dizer quais são os órgãos que fazem parte dos dois sistemas reprodutores. Ao **entrar** no minijogo 1 [música de fundo 1], aparece uma **imagem** com o sistema reprodutor feminino e **quadros** com os nomes dos principais órgãos, onde o jogador precisa **relacionar corretamente** cada um, **arrastando** o nome ao **espaço** especificado. Ao acertar, é emitido um **som de acerto** e **aparece** uma **descrição na tela** do órgão, para que serve e uma curiosidade sobre ele. Isso se **repete** a cada acerto. Se a relação não estiver correta, é emitido um **som de erro** e não acontece nada. Ao concluir, aparece uma **imagem** do sistema reprodutor masculino, onde o jogador deve proceder da mesma forma que a anterior. Ao fim, **volta** para o **cenário central**.

Novamente o Min precisa **percorrer** o cenário para achar o Super Biscoito. Dessa vez o Super Biscoito está acompanhado do amigo do Min e do Senhor Preconceito. **Há** um **diálogo na tela** entre os personagens [som: diálogo] e em **seguida** é direcionado para o minijogo 2 [música de fundo 2]. O minijogo 2 é um jogo da memória, em que o objetivo pedagógico é conhecer e identificar as **identidades de gêneros existentes**. O jogador deve **relacionar** o símbolo do gênero à sua descrição. São **18 cartas** ao todo, 9 com **símbolos** e 9 com suas **descrições**. Ao **clicar** em cada carta [som: clicar], ela **vira** revelando o que há nela. Se a relação estiver correta há um **som de acerto** e as duas cartas **somem** da tela. Se estiver errada, as duas cartas **desviram-se** novamente. Após acertar todas as cartas, o jogo é **redirecionado** para o **cenário central** e o jogo é **finalizado**.

Arte
<input type="checkbox"/> Personagens do jogo (Min, Super Biscoito, Amigo do Min e Senhor Preconceito);
<input type="checkbox"/> Vinheta de introdução;
<input type="checkbox"/> Tela inicial com botões de “início” e “ajuda”;
<input type="checkbox"/> Interface: controles;
<input type="checkbox"/> Tileset: Cenário central (rua);
<input type="checkbox"/> Tileset #1: casas
<input type="checkbox"/> Tileset #2: praça
<input type="checkbox"/> Tileset #3: lago
<input type="checkbox"/> Props #1: arvore, moita;
<input type="checkbox"/> Props #2: cerca, poste
<input type="checkbox"/> Animação: Min caminhando;
<input type="checkbox"/> Animação: Super Biscoito, Amigo do Min e Senhor Preconceito respirando;
<input type="checkbox"/> Interface: Caixas de diálogos na tela;
<input type="checkbox"/> Imagens dos sistemas reprodutores feminino e masculino;
<input type="checkbox"/> Interface: Quadros com nomes dos órgãos;
<input type="checkbox"/> Interface: Espaço para colocar os quadros com os nomes dos órgãos;
<input type="checkbox"/> Interface: Cartas do jogo da memória;
<input type="checkbox"/> Interface #1: Símbolos dos gêneros;
<input type="checkbox"/> Interface #2: Descrições dos gêneros.

Áudio
<input type="checkbox"/> Música da vinheta de introdução;
<input type="checkbox"/> Som: clicar;
<input type="checkbox"/> Som: fala;
<input type="checkbox"/> Música de fundo ambiente (cenário central);
<input type="checkbox"/> Som: diálogo;
<input type="checkbox"/> Som: acerto;
<input type="checkbox"/> Som: erro
<input type="checkbox"/> 2 Músicas de fundo para minijogos

Programação
<input type="checkbox"/> Loading;
<input type="checkbox"/> Tela inicial com botões;
<input type="checkbox"/> Min seguindo a tela;
<input type="checkbox"/> Câmera seguindo personagem;
<input type="checkbox"/> Comandos de movimento pelo cenário através das setas de orientação do teclado;
<input type="checkbox"/> Diálogos;
<input type="checkbox"/> Transição do cenário central para os minijogos e vice-versa;
<input type="checkbox"/> Verificação da relação (correta ou incorreta) entre os nomes dos órgão e a imagem do sistema reprodutor;
<input type="checkbox"/> Arraste de quadros dos nomes dos órgãos através do mouse;
<input type="checkbox"/> Vira, desvira e desaparecimento de cartas;
<input type="checkbox"/> Verificação da relação entre os pares de cartas.

Objetivo Pedagógico alinhado com a BNCC			
<input type="checkbox"/> Reconhecer os órgãos dos sistemas reprodutores feminino e masculino humano e suas funções (EF08CI11); <input type="checkbox"/> Conhecer e Identificar algumas identidades de gênero existentes (EF08CI11).	Ciências – 8º Ano EF		
	Unidade Temática	Objetos de Conhecimento	Habilidades
	Vida e Evolução	- Mecanismos Reprodutivos  - Sexualidade	(EF08CI11) Selecionar argumentos que evidenciem as múltiplas dimensões da sexualidade humana (biológica, sociocultural, afetiva e ética)

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