

## User perceptions of serious games and their features

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**Abstract.** Two-way, interactive and tailored education is a more promising form of education compared to traditional one-way passive education, as early literature evidence suggests. However, building a serious game that can engage users in the same way as an entertainment game, while incorporating both learning and gamification elements can be quite complicated. That is why the game concept, technology and features need to be designed carefully, in a user driven way. The authoring team makes use of their expertise in serious games in order to include engaging learning activities for the participants of the study. In particular, this study explores how users perceive the different elements, features and design of a collection of serious games on sex education. It shows which elements are of more importance to the users, what gives them a good experience, and what facilitates their learning. Findings are presented along with current research in this area, to conclude on the key elements for designing an effective and engaging serious game, based on user feedback. This study will be a step toward the design of tailored and relevant education interventions that will promote active learning, rather than passive one-way learning.

*Keywords: serious games, features, digital interventions, user perceptions, sex education.*

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## 1. Introduction

Recent research has indicated that individuals often underestimate their probability of facing unpleasant events or outcomes, such as contracting a Sexually Transmitted Infection (STI) (Eleftheriou A B. S.-S., 2019), and that this could be addressed appropriately using a sex education intervention. For example, an educational game (serious game) that focuses on the users and their immersion and engagement with a simulated population could potentially challenge the users' perception of invulnerability, as they encounter various people and scenarios that affect their health throughout the game (Eleftheriou A B. S., 2017).

Designing serious games with the purpose of effective learning and behavioural change, while keeping the user immersed and engaged can be quite complicated. Active learning can be achieved through serious games, but many design factors have to be considered in the game development process, in order for the intervention to have an impact. Additionally, the impact of such interventions is closely related to the context of the user needs, which can be better understood by mapping user perceptions to serious games design elements. Therefore, in order to develop better informed and effective serious games, a user-centered approach needs to be adopted, involving users in the design process (Cheek C, 2014).

The authoring team conducted a short analysis of certain game features and elements under the main areas of design and accessibility, including insights from current research on the topic.

As part of the sGuide sex education digital intervention (sGuide Sex Education Intervention), fourteen serious games were developed using Unity (Unity). The games vary in concept and characteristics, and tackle different sex education topics. In Phase 1 of testing, the sGuide intervention, which also included text, videos, infographics and quizzes was given to fourteen beta testers who tried out different games and provided feedback. The games were then improved and adapted according to the user feedback, and in Phase 2 a selection of the games was given to nine university students, who again provided feedback through a survey and interviews.

The purpose of this study is to take a closer look at user perceptions of serious games, how certain game elements and types affect their enjoyment and learning experience, and how to move to a more user-driven development of serious games. The research hypothesis is that in the case of serious games, learning holds a predominant position in user priorities, followed by enjoyment, scoring and storytelling.

## 2. Methods

### Game Types and Points of View

The game types and points of view in this section are described in the way they were utilized in the serious games developed as part of sGuide.

A game's perspective is determined by the camera and who you are in the game. Points of view in a gaming context may have different effects because they may impact the sense of involvement or immersion of the player according to their perspective and agency in the game.

#### First person view

The camera's perspective is from the player's point of view, and the player controls the game from their view directly. The main character is the player themselves, and they can act as though they are part of the environment. This point of view offers an intimate level of interactivity, where the player can be more invested to the story.

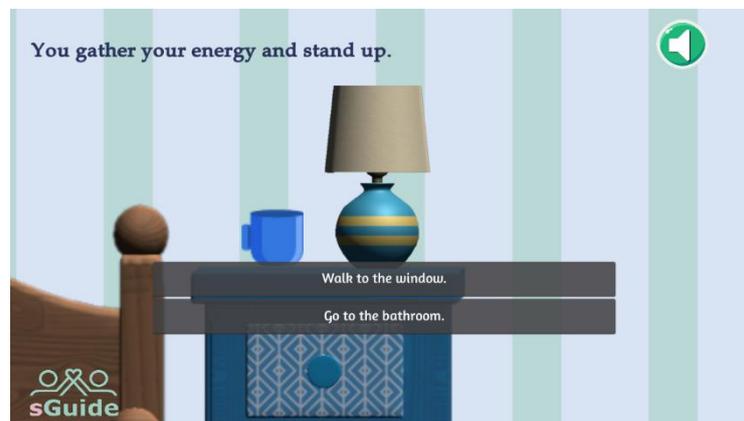


Figure 1 Screenshot from first person view game in sGuide (Preventive Care)

#### Third person view

The player watches a story envelop as they would a movie, and their character from an over-the-shoulder or behind-the-back perspective. A third person perspective can be limited or omniscient. In

third person limited the player only sees the events and story from the outside, while in omniscient they know the thoughts and feelings of the characters.



Figure 2 Screenshot from third person perspective game in sGuide (Condom Use)

### Visual Novel

A visual novel is an interactive fiction video game genre originating in Japan, that uses storytelling and small interventions from the player to drive the narrative.

Visual novels often use multiple branching storylines to create multiple endings, allowing freedom of choice to the user along the way.

Visual novels can tell a story both from a first and third person point of view.



Figure 3 Screenshot from Visual Novel game in sGuide (STIs)

### Non-linear gameplay (branching narratives)

Non-linear gameplay, or branching narratives is when the game can be completed in different sequences according to the player's actions. At certain points of the game, the player has to make decisions that affect how the story envelops. Non-linear gameplay offers greater freedom to the player, as they feel they have agency in the story.

Branching storylines can offer multiple endings, and are often used in visual novels.

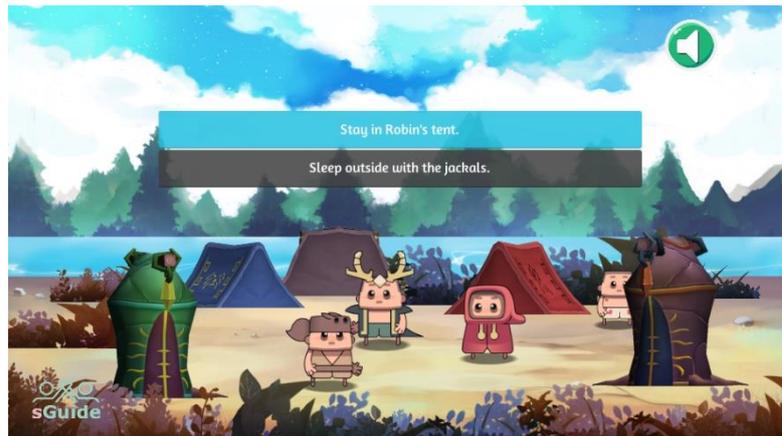


Figure 4 Screenshot from branching narrative game in sGuide (Sexual Responsibility)

## Quiz Format

In some of the games, instead of following a specific storyline, the player is presented with different scenarios or situations, and then they have to select the correct response. Alternatively, they are presented with images of objects where they have to identify them by name. This usually happens by giving a multiple choice list to the player.

In most of the games studied in this study, quiz-like questions are also embedded into non-linear gameplay.

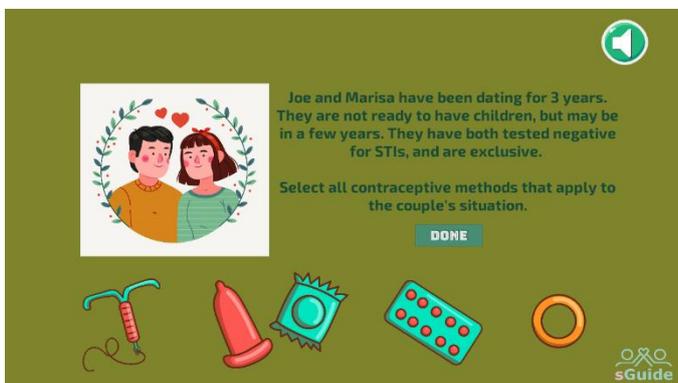


Figure 6 Screenshot from Quiz Format game in sGuide (Contraception)



Figure 5 Screenshot from Quiz Format game in sGuide (Gender Identity)

## Game Design Elements

### Aesthetics, Realism and Graphics

Something that has been overlooked in the design of serious games, is the importance of narrative and

aesthetics, as well as the principles of emotional design, which successful digital games have managed to tap into. Studies have demonstrated that narrative and aesthetics in serious games positively influence the perceived learning by facilitating a state of psychological flow and enjoyment. Aesthetics in a digital game can refer to the sensory phenomena (visual, auditory, aural, embodied) which the player can perceive (Alexiou A., 2020). In addition, it has been shown that elaborate or ultra-realistic graphics are not always necessary to induce a positive player experience and elicit emotional responses in players (Gerling, 2013). A well perceived aesthetic perspective in graphical design can be achieved through the colour palette, the choice and look of environments, character representation style, regardless of the level of fidelity.

However, realism does not solely depend on graphics, but also on the credible responses of non-player characters (NPCs), and sound. These three elements are demanded by players, regardless of their age or culture. An ideal solution would be to develop realistic game environments, while maintaining the focus on the learning aspect by not overcrowding the game world with unnecessary complex objects (Ravyse, 2017).

### **Characters, Dialogue and Storytelling**

Throughout the history of human culture, stories have been used as a medium to connect cultural values and learning or moral items in a meaningful correlation. Stories are relatable and can make teachings more memorable and understandable for the human brain (Kampa A., 2016).

In serious games, interesting characters, dialogue and narration can be used to immerse the player into the story and consequently transmit the key messages that need to be learned. Characters bring action to the story, and trigger involvement by identification of the player with the characters (Cheek C, 2014).

In storytelling, dialogue plays an important role in driving the story forward, and imbuing it with emotion and relatability.

### **Learning**

The main purpose of serious games, and what differentiates them from traditional video games is learning and transmitting certain key messages to the player. Often serious games aim to introduce new perspectives, which can be achieved with character identification and engaging stories. However, often in serious games, not enough emphasis is given on developing a model that successfully integrates educational theory and game design aspects, in order to maximize the impact of educational games (Kiili, 2005).

### **Scoring**

Scoring in serious games is an element that has to be carefully designed in order to motivate the player to keep playing and learning, while assessing their performance. It gives players a clear and attainable goal, that provides a structure to their gameplay. It is especially motivating to players when it is publicly accessible in the form of leaderboards, where they can see their progress and performance compared to other people. However, it can have its drawbacks, for example when players act with the sole aim of achieving a higher score (Toups, 2009). This is especially disadvantageous in the case of serious games, where the main purpose is learning and assimilating the material, or understanding certain perspectives.

### **Instructions and Navigation**

Writing good instructions to accompany a game can lift much of the confusion the player may have regarding the controls and goal of the game.

### **Goal, Challenge and Feedback**

Studies have shown that clear goals, challenges that match the player's skills, and immediate feedback are key elements to designing an effective serious game that has an impact on the players' learning (Wang, 2014).

### **Inclusion**

Players feel that diverse game characters are important for their gaming experience, as well as societal ly.

This is especially the case in the LGBTQIA+ community, people with disabilities and ethnic minorities (Diversity & Inclusion Study, 2020).

Therefore, diversity and representation of all groups is something that needs to be considered in order to develop an inclusive game, and achieve player identification with the characters.

Historically, in the most famous games where players piloted characters around space, main characters

were designed to be male. From 2017 to 2021, over a 100 games were surveyed, and nearly 80 percent

of the game main characters were male, 54 percent were white, and only 8 percent had a female main character of non-white ethnicity. It's also worth noting that 31 percent of the games had only male characters (Diversity in gaming, 2021).

A 2015 survey of students between the ages of 11 and 18 showed that less than 40 percent of high-school boys preferred to play as male characters, while 60 percent of girls preferred female ones (The games industry is wrong about kids, gaming and gender, 2015).

### 3. Procedure

Eight games were selected from sGuide for this study, which showcase different characteristics and game concepts as described in the previous section. These are listed in table 2 in Section 3.1. Beta testing of the games was conducted in two phases.

**Phase 1:** Phase 1 was conducted online, with users being between ages 24-35. The feedback collected from the beta testers at the end of each game is listed and categorized into themes that have to do with the game concept and design elements (tables 3,4,5,6). The occurrences and mentions of each theme are counted to present an indication of the design elements that are more important to serious games users (tables 7,8).

**Phase 2:** Phase 2 was conducted physically, in a university classroom with computer science students. The beta testers played all the games, and were then asked to fill in a survey with questions about their design elements and impact. User interviews were also conducted, producing more user feedback that was again categorized into themes (table 9).

	<b>Phase 1</b>	<b>Phase 2</b>
<b>No. of participants</b>	14	9
<b>Age range</b>	24-35	17-20
<b>Gender</b>	64% female, 36% male	78% male, 22% female
<b>Place</b>	Online	University Classroom

Table 1 Participant information from Phase 1 and 2 of beta testing

The main difference in the methodology of the two phases, is that in Phase 1 the users gave game-specific feedback after playing each game, while in Phase 2 the users played all the games, and then filled in a survey and gave more generic worded feedback. It is worth noting that after Phase 1, the games were revised according to the user feedback that was collected, and their revised versions were presented to beta testers of Phase 2.

In the feedback tables, light red was used to indicate negative feedback or feedback for improvement, while light green was used to indicate positive feedback.

The insights derived from the feedback collected in both phases, as well as from the survey and user interviews from Phase 2 are then combined and presented.

#### Game categories

The games used in both beta testing phases are listed in table 2, in four distinct categories, along with their main characteristics and game format.

It should be noted that the games have some common characteristics, such as they are in 2D, they are single-player games and at the time they were only offered in English.

<b>Game\Characteristics</b>	Point of View	Branching Narrative	Characters	Quiz Format
Gender Identity	Third person	No	Multiple	Yes

Preventive Care	First person	Yes	Player as main character	Partly
Camping Series (3 games)	Third person	Yes	Multiple, player acts as the main character	Partly
Visual Novel (3 games)	Third person	Yes	Two	Partly

*Table 2 Game titles and their main characteristics*

## 4. Results

### I. User Feedback from Phase 1

#### I. Gender Identity (quiz format)

In this game, the camera view slides through a series of characters. Each character tells a story that shows their experience with gender roles and identities. In each case, the player is then given a list of gender identities from which they have to choose which gender identity matches the character the most. In the end, the player is asked to select how they would communicate with a transgender person in a respectful way. This game mostly follows a quiz format, as the player is not directly interacting with the characters' story, but is however put in the process of understanding their different perspectives.

#### User feedback:

Themes	Feedback
Navigation, Instructions	"...make it obvious that to move to the next dialogue you need to click anywhere on the screen."
a. Challenge b. Learning	"...show the character's story somewhere along with the gender identity choices to be able to look back at it. For someone quite new to the topic might not be able to remember everything and link up the dots."
a. Feedback b. Scoring c. Learning	"In the game, when you answer multiple choice questions, you get a point for correct answer and no point for wrong answer. However it is important to also learn what is the correct answer once you answer wrong so that you learn from the mistake."
a. Learning b. Interactive c. Enjoyment d. Storytelling	"The game was the best so far, it was nice to have short texts for each person and then have to identify their gender."

Table 3 User Feedback on Gender Identity (Quiz Format) game (Phase 1)

#### II. Preventive Care (First Person View)

In this game the player is the main character and has a first person point of view. They find themselves in a specific situation and can choose how to interact with the environment and other characters. The character in this game has just finished having sex with their partner, and has to select appropriate ways to wash up, how to communicate with their partner regarding STIs, and what action to take if they believe they have an STI.

#### User feedback:

Themes	Feedback
Inclusion	"A slightly woman-focused topic. Not necessarily a bad thing but wonder if there could be an option to choose between male-female and get more sex-specific info."
a. Feedback b. Learning	"It would help to get some feedback at the end with the mistakes or the steps you could have taken to increase your score."
a. Interactivity b. Enjoyment	"I liked this type of game! It was slightly different from the previous ones; more action driven than a quiz-like game."

Table 4 User Feedback on Preventive Care (First Person view) game (Phase 1)

### III. Camping Game Series

The camping game series consists of three games that take place in a camping setting. The topics of the games are:

- a. You are responsible for your own sexual health
- b. Condom use
- c. Communication and consent

This series follows a protagonist character that interacts and goes on adventures with a group of other characters. The other characters include intelligent agents who provide insights to the protagonist, as well as characters with whom the protagonist navigates romantic and sexual relationships. Throughout the games, the player makes decisions on how the protagonist will act, how they will communicate their feelings to their partner, and other choices affecting their sexual health. According to the player’s choices, the story may follow different paths and conclude in multiple endings.

The player gets points when they communicate their feelings, respect their partner, and avoid sexual risks by making responsible choices.

#### User Feedback:

Themes	Feedback
Scoring	“...it wasn’t super clear how you score a point.”
Graphics	“Graphics need improvement.”
Scoring	“How do I know if my score is good or bad?”
Scoring	“...it is not clear what that score is about, doesn't get displayed anywhere or is not clear if it counts somewhere. I get it that it goes up and down depending on the responses but still, what is a good score, where can I see my score of each exercise, is there an overall score, what is the maximum score and out of that how much did I get?”
a. Interaction b. Learning	“I was actually disappointed it ended so quickly and wanted to go back and try different answers.”
a. Goal b. Scoring c. Interactivity d. Instructions e. Learning	“I am not sure if this is the point of the game but when the instruction says I will be losing points when I make a decision that is disrespectful I automatically wanted to collect points therefore I was clicking what I perceived as “respectful” and not really what I would do in reality. I wonder if the point collection was not an aim in the game, if lessons would be “learnt” better because I could have failed to stay safe and then learnt a lesson because of it. Then I would avoid doing the same mistake in real life. Maybe I will try to “lose points” in the next chapter to see what happens!”
a. Scoring b. Instructions	“There should be an introduction to the scoring system. I couldn’t tell whether I performed well or not, or which of the questions contributed to the score.”
Accessibility	“You should have translations to multiple languages.”
a. Storytelling b. Learning c. Enjoyment	“I loved the dialogues in the game. The game was enjoyable and educational.”

Table 5 User Feedback on the Camping Series (Third person view, branching narratives) games (Phase 1)

### iii. Visual Novel

There are three games that fall under the Visual Novel category. In the forest game, the player follows a story envelop between two characters who talk about their relationships and sexual orientation, and has to answer questions related to the topic.

In the Sherlock Holmes themed games, the player follows a discussion between Sherlock and John. In the first case the player has to follow the clues provided to determine which STI John suffers from, and in the second case they have to determine the sexual dysfunction John suffers from, as well as its causes. The player can also guide the line of questioning that Sherlock follows in order to discover more clues that are relevant.

**User Feedback:**

<b>Forest Game (Attraction, LGBTQI+)</b>	
<b>Themes</b>	<b>Feedback</b>
Inclusion	“It would be awesome if the user could select to play the game with female characters instead of male.”
a. Feedback b. Learning	“It would be good to highlight the correct answer during the game if the player makes a mistake.”
a. Interactivity b. Learning c. Accessibility	“...found it too academic...Also the game was slightly long considering the amount of times the user was required to make a choice.”
Accessibility	“When it becomes nighttime and the scene becomes dark the box with the text also becomes darker making it difficult to focus on it.”
a. Challenge b. Learning	“The difficulty level was a lot higher than the previous topics. I find that some of the questions were long and phrased in a way that I had to take some time to fully understand them before answering.”
Storytelling	“The game was a nice way of introducing these notions through storytelling.”
<b>Sherlock Holmes games (STIs, Sexual Dysfunction)</b>	
<b>Themes</b>	<b>Feedback</b>
a. Storytelling b. Interactivity c. Learning d. Enjoyment	“It was funny, to the point and highly interactive.”
a. Storytelling b. Enjoyment	“The dialogues in the game were super witty and amusing.”
Inclusion	“The game on sexual dysfunction was quite male-centered.”
a. Storytelling b. Enjoyment	“There was a continuation of the story in some of the games, which I enjoyed.”

Table 6 User Feedback on Forest and Sherlock (Visual Novel) games (Phase 1)

<b>Game/ Themes</b>	Scoring	Goal	Challenge	Learning	Storytelling	Enjoyment	Interactivity
Gender Identity							
Camping Series							
Visual Novel							

Preventive Care							
<b>Total number of mentions</b>	6	1	2	11	6	6	5

Table 7 Feedback mapping into design and gameplay related themes (Phase 1)

Game/ Themes	Accessibility, Language	Inclusion	Instructions, Navigation	Feedback	Graphics
Gender Identity					
Camping Series					
Visual Novel					
Preventive Care					
<b>Total number of mentions</b>	3	3	3	3	1

Table 8 Feedback mapping into design and accessibility related themes (Phase 1)

## Trends from Phase 1

Trends arise from the user feedback, showing the elements that are more significant for the user experience in these serious games, according to the themes that were most mentioned. It should be noted that not all users attempted all the games from the list.

The themes or game elements that were mentioned the most (regardless of negative or positive content) were the following, in descending order:

1. Learning
2. Enjoyment, Storytelling, Scoring
3. Interactivity

An important observation is that when the user knows they are playing a serious game, rather than an entertainment game, their main expectation shifts from enjoyment to learning. During their experience, they align with the educational purpose of the game, and if their learning expectations are not met, they question how the key learning messages could have been better transmitted. More specifically, if a learning message exists, by the end of the game they want to feel certainty and security in their understanding of it. On the other hand, in the cases where positive remarks were made on the learning aspect of the game, the players also seemed more immersed and engaged, and their experience was more fulfilling.

Enjoyment and storytelling are also at the top of the list of elements that matter to serious games players. A good story, characters and dialogue keep the player invested, and learning becomes a side

effect of being engaged with the story. In this case, only positive comments were made regarding either enjoyment or storytelling.

Another of the main recurring themes that arise from the feedback is the games' scoring system, when there is one. The player wants to know how it works and how they can maximize their score. From the moment they realise a scoring system exists, they want to have clarity on how to increase their performance. If there is a lack of clarity or consistency, their engagement and immersion in the game can be easily broken and turned into confusion or anxiety.

However, it is interesting to see that in cases where the game offers space for experimentation and learning through making mistakes in a safe setting (mainly in non-linear games with branching narratives), users are more interested in trying out different paths of the story, and expressing what they would do in real life, rather than being concerned with score. This indicates a great case where a scoring system may be superfluous or even confusing, as by "hacking" the scoring system to maximize their score, the player misses out on getting the full experience of the game by making different choices.

Clarity in learning can still be provided through appropriate feedback mechanisms, while keeping a consistent scoring system in the background. This can bring learning to the forefront as the main goal, instead of performance.

Interactivity was next on the list of most mentioned themes. It has mostly positive mentions, with the users feeling more excited when a game is highly interactive, and less so if too much time passes without being given an opportunity to interact.

In Visual Novel games, storytelling and enjoyment had the highest number of positive mentions, and a correlation between them is obvious. The game type that had the most positive impact on learning was Branching Narratives (Camping Series).

Another interesting observation is that the themes with the least number of mentions were graphics and goal, once more indicating that both entertainment and serious games can be successful regardless of the graphics, as long as other design elements that are important to the user are taken into account.

Inclusion is also a theme that is pointed out, as when there are elements of gender identification with the character, they would expect the game and learning messages to be tailored to their personal identities and needs.

Following the feedback collection from Phase 1 of the beta testing, improvements were made on the games to address comments on scoring, feedback, instructions and navigation, as well as the goal of the games.

In Phase 2, the users were given the revised versions of the games.

## II. User Feedback from Phase 2

After the second round of testing (Phase 2), feedback was collected in two ways:

1. User Survey
2. User Interviews

## User Survey

The user survey mainly contained questions that investigate which type of game was more enjoyable and interactive for the users and which helped them learn the most, and how much certain game elements such as language, animation, and storytelling affected the user experience.

Which type of game was the most enjoyable?

9 responses

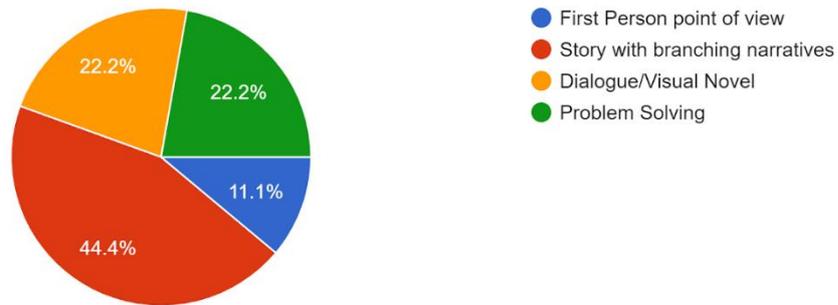


Figure 7 Enjoyment according to game type

Which type of game was the most interactive and immersive?

9 responses

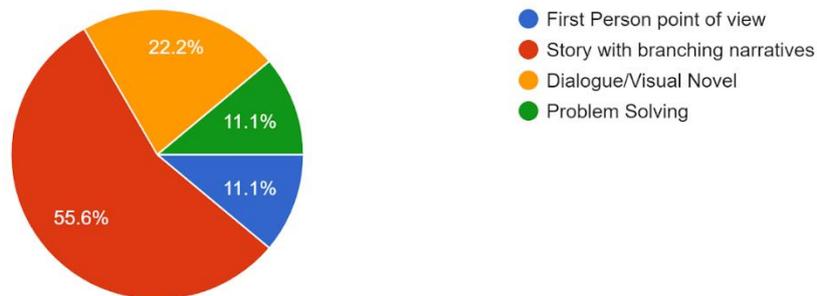


Figure 8 Interactivity and immersion according to game type

Which type of game helped you learn the most?

9 responses

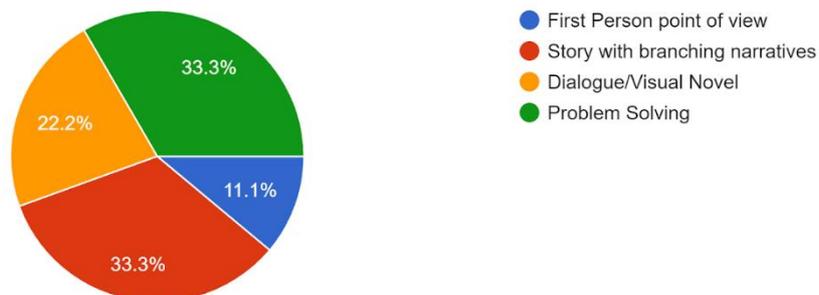


Figure 9 Effectiveness of learning according to game type

Figure 10 Effect of graphics on user experience

Do you find it more enjoyable when the game has a story or narrative?

9 responses

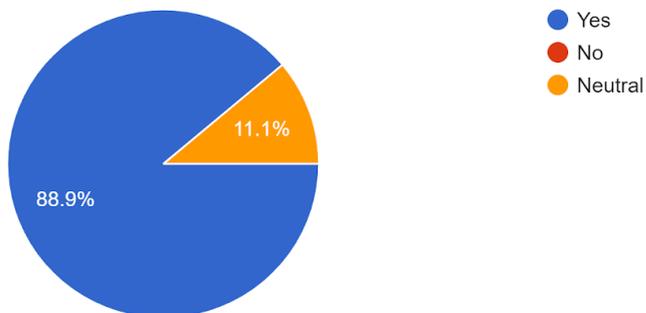
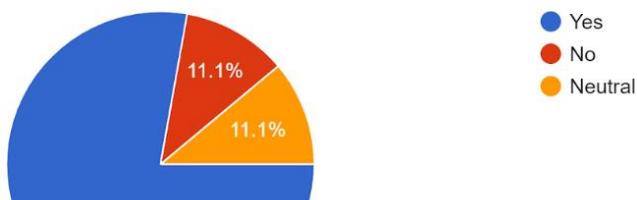


Figure 11 Enjoyment related to story and narrative

Do you feel it helps your learning when the game has a story or narrative?

9 responses



How did the graphics of the games affect your experience?

9 responses

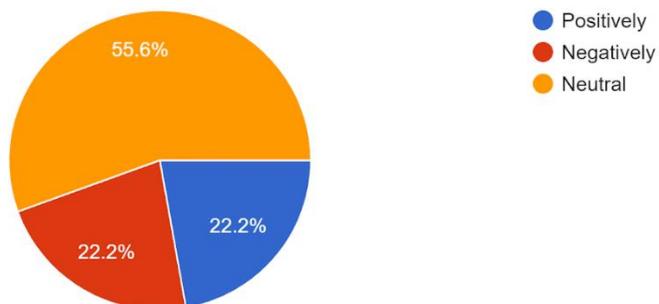


Figure 12 Effectiveness of learning related to story and narrative

Which character format do you prefer?

9 responses

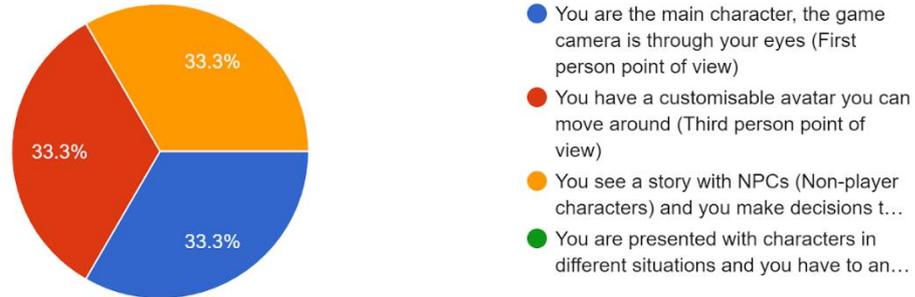


Figure 13 Preference of character format

Did you find the dialogues between the characters realistic?

9 responses

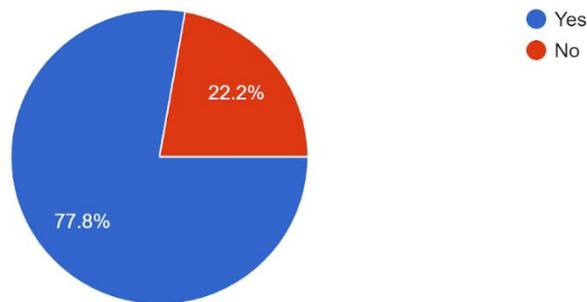


Figure 14 User perceptions on game dialogues

Would it add to your experience if there was more animation in the games?

9 responses

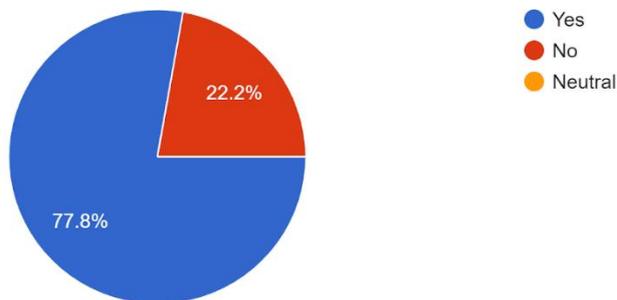


Figure 15 User perceptions on game animations

Did you feel the games were inclusive?

9 responses

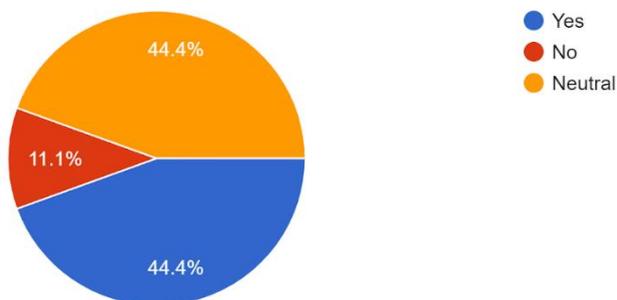


Figure 16 User perceptions on inclusivity of games

How did the language affect your experience?

9 responses

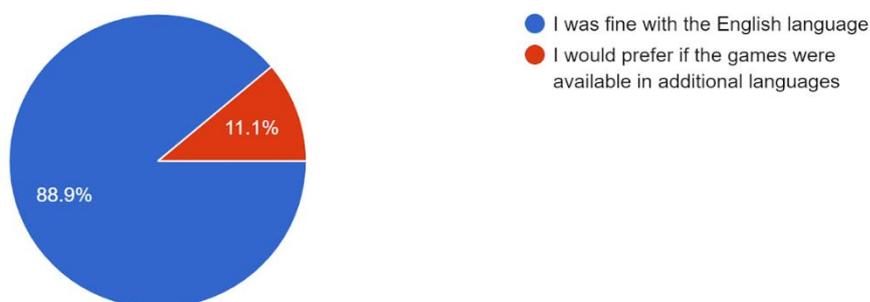


Figure 17 Effect of language of games

## User Interviews

After the testing and survey were completed, there was a discussion with the participants, and they were also asked to provide feedback in a form, shown in the table below.

Themes	Feedback
Graphics	“I would like to see more realistic characters that look my age instead of cartoons that look younger. It was a bit childish.”
Interactivity	“I would like to have more choices in the branching narrative games, that affect the ending more drastically.”
Inclusion	“There should be warnings when something will be shown that may trigger experiences of abuse or similar in players.”

Learning	“I would like to see more explicit content.”
Inclusion	“I didn’t realize the main character was of a different gender than mine. It made me feel confused.”
Challenge	“I felt I already knew most of the information provided.”

Table 9 User feedback categorised in themes (Phase 2)

## Trends from Phase 2

The most enjoyable games for the participants of Phase 2 were the Camping Series games, i.e. the non-linear branching narrative games, which were also ranked as the most interactive and immersive. However, in the question of which type of game helped their learning the most, the Quiz Format (or problem solving) games were ranked the same as the branching narrative games, showing that the way the learning element is incorporated is also important.

Another important element that arises is interactivity, as the participants would like to have more opportunities to interact with the game and affect the story (especially in branching narratives).

Almost everyone found that when games have a storytelling element they are more enjoyable, verifying the correlation between storytelling and enjoyment that was drawn in Phase 1. They also stated that storytelling helped them with learning.

Again in the context of serious games, learners were not as concerned with graphics, as most of them were neutral about them affecting their experience. However, most participants believe that if more animations were used in the games it would add to their experience.

In terms of how characters were employed in games, opinions and experiences differed, as preference between character formats (first person point of view, customizable avatar the player can move around, NPCs where the player can make decisions in their story), was equally distributed.

Identification with the game characters is extremely important for users, especially adolescents who participated in Phase 2. Often they were confused about the gender of the character they controlled, and if it was a different gender from their own gender identity they were often upset and engagement with the game experience was broken. This goes to show that inclusion of all gender identities and sexual orientations is important to players in order to be immersed in the story and game. However, it has to be used in combination with personalization elements, for example giving the players the choice of building a customizable avatar and/or shape the story itself. They would also prefer more realistic characters instead of cartoons, which again is a factor that would increase identification of the player.

## 5. Discussion

The design decisions that need to be taken when developing a game are countless, and the process becomes even more complicated in the case of serious games, where effective learning is a crucial requirement, on top of requirements like enjoyment, interactivity, and accessibility.

Research shows that in order to address user needs and create effective and informed serious games, a user driven approach should be followed in the game development process and selection of different game elements.

This study was done by analyzing user perceptions of serious games and their features, developed as part of sGuide, a digital sex education platform.

Even though there were limitations in the participant groups, as the majority had a similar educational and ethnicity background, and there was an under-representation of minority groups, this is a first step in understanding how users perceive serious games and their features, and how different game types and design elements can enhance or disrupt the user experience and effective learning.

The results showed that in their experiences with serious games, users most of all value learning, and that an important design factor is how to transmit key learning messages through play in an effective manner. It can also be deduced that when players feel they are learning, they seem more immersed and engaged in the game, and their experience is more fulfilling. It is not clear however if learning causes the immersion or the other way round, or both.

Enjoyment and storytelling are also at the top of the list of elements that matter to serious games players. A good story, characters and dialogue keep the player invested, and learning becomes a side effect of being engaged with the story, as the participants said that storytelling helps them in learning. Another important element is interactivity, as users seem to enjoy serious games more when there is high element of interactivity, as opposed to not having many opportunities for action.

In Visual Novel games, a positive correlation was drawn between storytelling and enjoyment, while the game type that had the most positive impact on learning was Branching Narratives (Camping Series). A correlation can be drawn here as well, between learning, enjoyment, interactivity and immersion as in Phase 2 the most enjoyable, interactive and immersive games were the Camping Series games.

Another interesting observation is that the themes with the least number of mentions were graphics and goal, once more indicating that both entertainment and serious games can be successful regardless of the graphics, as long as other design elements that are important to the user are taken into account. Inclusion and especially personalization were important for the participants to be able to feel identification with the game characters, as well as more realistic and relatable characters.

In summary, the most important elements for users were: **Learning, Storytelling, Enjoyment, Interactivity and Identification.**

The results show that for a serious game to be successful, user-driven development is crucial. User needs need to be acknowledged during the design process, in order to be able to create tailored, interactive content for active and effective learning.

## Conclusion

The outcomes indicate that a well-designed game concept, with a good story, inclusive characters, and successful incorporation of the learning element, are the foundations of a successful serious game, as opposed to elaborate graphics and functionality.

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