Investigating the Role of Adaptivity in Video Games for Attitude Change

David Šosvald and Lukáš Kolek
Charles University, Faculty of Mathematics and Physics, Prague, Czech Republic

sosvald@ksvi.mff.cuni.cz
kolek@ksvi.mff.cuni.cz

Abstract: Video games have become one of the most widespread forms of media in the 21st century, bringing interactive digital narratives to over 3 billion people globally. Like other media, video games feature topics from our society, culture, and history. Research has shown that narrative-driven video games have a unique potential to influence explicit and implicit attitudes toward the topics they depict. However, the concrete mechanisms through which video games shape our attitudes remain unclear. Identifying the mechanisms behind the attitude-shaping effect would help to design more effective educational games and simulations. One aspect that reduces the potential of video games to change attitudes is a so-called credibility bias, a phenomenon where information contradicting one's pre-existing beliefs is deemed less credible. For this reason, our work focuses on employing adaptivity to improve the attitude-shaping effect of video games. We hypothesize that adapting gameplay elements based on players' pre-existing attitudes will mitigate the credibility bias, leading to greater attitude changes and enhanced game enjoyment compared to a static presentation. We propose assessing players' attitudes before playing and adapting the game content accordingly, utilizing in-game metrics to track players' actions to further refine the content. This work focuses on adapting highlights in user interfaces, narrative-related messages, and in-game goals. To empirically test our hypothesis, we have developed two versions of a video game – an experimental version featuring adaptive game elements and a control version with static content. For this proof-of-concept experiment, we have chosen the topic of electromobility, but we designed the adaptive elements to be usable with any topic. The experimental game is a delivery manager simulator featuring electric and combustion engine cars, with the aim of showcasing the usability and advantages of electric cars. Our experimental design involves a pretest-posttest setup with an experimental and a control group. We utilize measures for implicit and explicit attitudes and game enjoyment. This empirical study will bring valuable data reacting to the identified research gap. Should the adaptive approach prove to be usable, it could be widely utilized to improve the attitude-shaping potential of educational games.

Keywords: Game-based Learning, Video Games, Implicit and Explicit Attitudes, Persuasive Games, Attitude Change, Adaptivity

1. Introduction

Video games are no longer just entertainment products. They increasingly address real-world topics from our culture, history and society (Muriel and Crawford, 2018). Enough empirical evidence exists to support the idea that video games have the potential to affect our attitudes toward the topics they depict (Kolek et al., 2023). This makes games arguably one of the most important forms of informal education media, as they might significantly influence popular culture representations of violence, stereotypes, conflicts, or history, among other things.

However, not every game designed to change attitudes has the desired effect, as evidenced by several studies examining the impact of video games on attitude change. Both positive and negative findings regarding the potential of games to affect attitudes have been reported (Kolek et al., 2023). One of the reasons that some games do not shape attitudes as intended might be a phenomenon referred to as credibility bias, which makes us perceive information from a source that we do not trust or do not view favourably as less credible (Pornpitakpan, 2004). We also tend to deem information conflicting with our beliefs as less credible and vice versa. Such phenomenon is known as motivated reasoning (Epley and Gilovich, 2016).

As research has shown that the credibility of the source of a message impacts the resulting attitude and behaviour change, and that information perceived with high credibility has greater attitude change potential (Flanagin and Metzger, 2020), the aforementioned phenomena make it challenging for games for attitude change to convey their message in a way that achieves the desired attitude change.

We propose adapting a game's persuasive content based on players' initial attitudes to mitigate credibility bias. To our knowledge, adaptive persuasive content in the context of games for attitude changes has not yet been investigated before, especially in relation to its potential to overcome credibility bias. This makes our study a first-of-its-kind experiment to employ this technique in a game's design and to gather data on the phenomenon.

This work presents the experiment design of a planned empirical study. We will present the experimental games that have been developed, the design of the experiment, our game design solutions to implementing adaptivity for persuasive content, and the design strategies that allow the usage of our methods for other game genres and attitude-bearing topics.

If our initial results are positive, we will conduct further studies, testing the approach with more topics, game genres, and target groups. The adaptive approach could, as a result, prove very useful in educational games that target socially sensitive topics (e.g., a game for peace-making among two parties of a conflict). It might also be a powerful tool for games for attitude change in general.

1.1 Hypotheses

We hypothesize that games gradually providing players with attitude-related information based on their initial attitudes will lead to more significant attitude changes and to greater enjoyment compared to games providing players with intensive attitude-related information from the beginning.

Hypothesis 1. *The adaptive version of the game will cause greater positive explicit attitude change towards electromobility than the static version, especially for players with negative initial attitudes.*

We expect that tuning down the persuasive content for players with negative and neutral initial attitudes towards electromobility will reduce the otherwise highly induced credibility bias, which will, in turn, help to accept new information about the topic (Flanagin and Metzger, 2020).

Hypothesis 2. *The static version of the game will cause greater positive implicit attitude change toward electromobility than the adaptive version.*

We do not expect the adaptive version to enable greater implicit attitude change than the static version because implicit attitude changes are mediated mainly by frequent co-occurrences of concepts with positive values, and electromobility will more frequently occur with positive values in the static version (Gawronski, 2022).

Hypothesis 3. *The adaptive version of the game will be more enjoyable than the static version.*

We expect players' enjoyment to increase when the game's content and roles are better aligned with their attitudes, as previous research confirmed increased enjoyment when players identify themselves with the character or the role offered by the game (Hefner, Klimmt and Vorderer, 2007; İskender, 2023).

2. Theoretical Background

When discussing one's thoughts, we use the term attitude to talk about the evaluation of an object of thought (Vogel and Wänke, 2016). The important feature of attitudes is that they tend to view the object positively or negatively, thus giving us a form of assessment. As attitudes play an important role in how we process information, they influence how we shape our views of the world (Pratkanis, 1989).

We use the Associative-Propositional Evaluation model (APE model), which was reported to be the most prominent dual-process theory of evaluative learning, in the design of our experiment (Hütter, 2022). The model distinguishes between explicit and implicit attitudes. Explicit attitudes involve reasoned evaluations based on information we already have available, leading to logical conclusions about an object of thought. Such attitudes can change when new information challenges existing beliefs, prompting a reassessment (Gawronski and Brannon, 2019). Explicit attitudes are measured using self-reported questionnaires.

The fundamental means of altering explicit attitudes is by processing information associated with the object of that attitude. But when we encounter information that contradicts our existing attitudes, it influences our assessment of the source's credibility. In cases where the information conflicts with our attitudes, we tend to perceive the source as less credible. If the information aligns with our attitudes, we might perceive the source as more credible and devote it more time (van Strien et al., 2016; Brannon, Tagler and Eagly, 2007). This phenomenon is known as credibility bias, and it typically leads to the formation of filter bubbles and polarization in society (Spohr, 2017).

Implicit attitudes are immediate affective responses based on associative evaluations and their structure in our memory (Hütter, 2022). The associations we recall concerning an object of evaluation influence the resulting response. The associations recalled may depend on the context of the information (Gawronski, 2022). They are typically measured using response time measurements (Greenwald, McGhee and Schwartz, 1998).

Implicit attitudes are formed mainly by stimuli co-occurrences. The quantity and frequency of these co-occurrences in our life and socio-cultural environment shape our implicit biases (attitudes). If a stimulus is often encountered in relation to another stimulus, which we perceive positively, we start associating the first stimulus with a positive response. Our implicit attitudes do not necessarily reflect what we consider right. To some extent, our implicit attitudes contribute to our behaviour and decision-making. It was shown that implicit attitudes can be influenced by stimuli co-occurrence (Gawronski, 2022).

Video games can present attitude-related information and, as such, can play an important role in attitude changes. The most recent meta-analysis by Kolek et al. (2023), which focused on narrative video games' effect on players' attitudes, identified that narrative video games can affect players' explicit and implicit attitudes.

Narrative video games incorporate storytelling elements into the gameplay, allowing players to interact with the narrative, shape outcomes through their actions, and become immersed in the game world (Kolek et al., 2021; Smethurst and Craps, 2014). It was shown that narratives, compared to non-narrative formats, reduce audience resistance towards changes in beliefs, attitudes, intentions and behaviour, with narrative engagement being pointed to as one of the possible factors (Ratcliff and Sun, 2020).

However, although it was proven that video games, especially narrative ones, have a significant potential to alter players' attitudes, not every game alters them towards the topics that it presents (Kolek et al., 2023). Therefore, it is important to determine the key game elements responsible for attitude change. One option is that the key element is the experience of playing the game itself, which would make flow, immersion and engagement the key elements for attitude change (Tussyadiah, 2018). Another option is that it is a game mechanic, or a combination of a few, which determines the persuasion potential (Orji, Vassileva and Mandryk, 2014). It is also possible that the respondents' characteristics influence the resulting attitude change, but a study by Kolek et al. (2024) did not confirm this. Identifying the elements responsible for attitude change is a key task for the whole game-based learning area, which is experiencing significant growth in recent years (Allied Market Research, 2022).

2.1 Adaptive Video Games

There currently exist many adaptive learning systems (Kabudi, Pappas and Olsen, 2021) that utilize a wide variety of AI methods and change the educative content based on a student's individual needs, e.g., by adapting the difficulty of the content and the hints provided (Hooshyar et al., 2021), but adaptive games for attitude change are mostly in their beginnings.

A serious game by Bjørner (2023) uses Dynamic Difficulty Adjustment in a game about ocean pollution, but the only measure is how successful the players are at the game and only the game's difficulty is tweaked. There is no adaptivity of the persuasive content.

Regarding persuasive content, Orji, Mandryk and Vassileva (2017) adapted a serious game's persuasive strategies to players' personality types, which was reported to improve the game's effectiveness in promoting positive attitudes. It also showcased that it is possible only to adapt the persuasive content while leaving gameplay unchanged. However, players' initial attitudes were not considered.

We did not find any work that adapts a game's persuasive content based on players' initial attitudes. This identifies a research gap our work aims to fill by bringing the experiment design to collect the first empirical data.

3. Experimental Games

3.1 Genre Selection

We needed to select a game genre that provided us with a lot of game elements that we could adapt to allow us to properly test our experimental approach and to discover which game elements are best suited for adaptation. We also wanted the game to alter between more and less intensive gameplay periods so that the player can get immersed but also has the opportunity to have a mental pause and to reflect on their choices.

The genre of a package delivery simulator game fits such needs because it provides us with several rounds of 1) managing a fleet of vehicles, possibly buying new ones, 2) the main gameplay, when the player sends their vehicles (with varying properties) to deliver packages, and 3) a level summary with various statistics. This gives

us numerous elements we can adapt and explore their effects on players, including round and bonus goals, vehicle properties, statistics highlights, pop-up tips, and many more.

Such a game also fits the need to alter intense gameplay with reports and management, as the main gameplay (sending vehicles to handle parcels) is interleaved with post-level reports and management of the player's vehicle fleet.

3.2 Topic Selection and Approach

We have searched for a socially sensitive topic towards which we can expect varying attitudes in the Czech Republic. According to a survey by the European Investment Bank in 2022, less than one-fifth of Czech residents is planning to buy an electric vehicle as their next one. A public opinion research conducted by the Ipsos agency earlier this year reported that compared to other EU countries, Czechs have the lowest interest in electromobility in the upcoming year.

Before designing the attitude-bearing content, we read news reports, motorsports magazines and scientific papers regarding electromobility. We also searched for electric car reviews and documentaries. These proved to be very insightful, as people mentioned their experience with daily electric car usage and the common issues regarding owning an electric vehicle.

3.3 Gameplay

The experimental game is a casual strategy game where the player takes on the role of a manager for a delivery service company. The game features several levels, with the main game loop being:

1. Manage your vehicle fleet – choose the vehicles to use in the next level, buy new ones at the mechanic, assign equipment to vehicles.
2. Play the level – control your vehicles on a map, pick orders up and deliver them to their target location. Ensure that sent vehicles are capable of carrying the given packages.
3. View a summary of the level – successful and failed parcels, income statistics, and the cost of maintenance and fuel/electricity.

Figure 1 shows an example of the main gameplay – the player planning delivery routes for their fleet of vehicles. Here, a car is on its way to pick up a package. We can see that the car has two free slots and the icons on the right showcase that this type of vehicle can carry packages and food.

Other vehicles in the game include motorcycles and vans. The vehicles differ in the amount and type of goods they can carry. All of the vehicle types feature both combustion and electric alternatives.

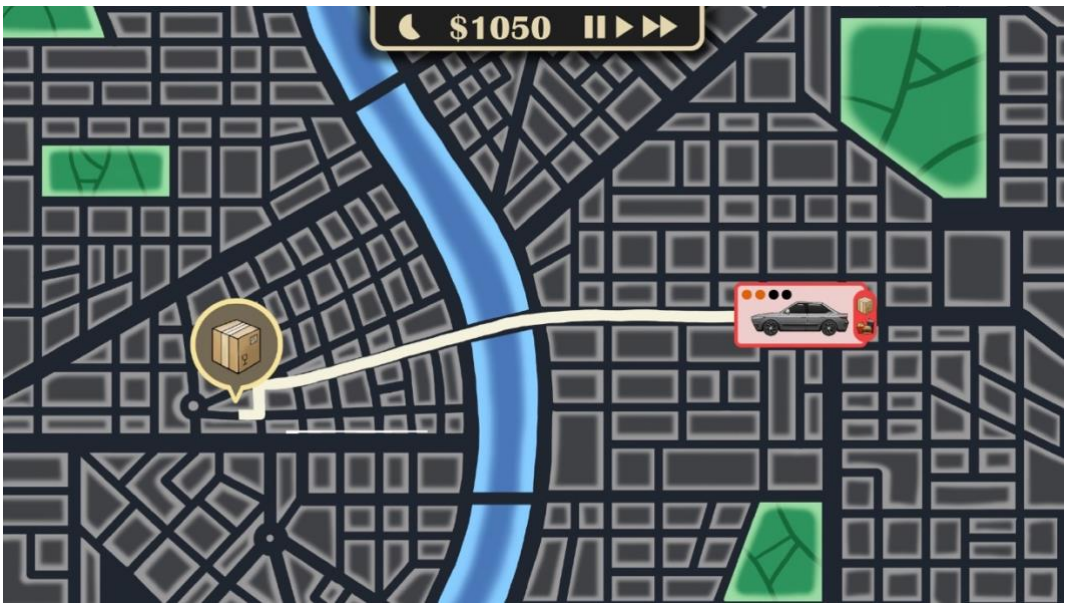

Figure 1: An example of level gameplay. We can see the remaining time, current earnings and time controls at the top.

3.4 Adaptivity

We first selected the game elements that we will adapt. The meta-analyses by Braddock and Dillard (2016) and Kolek et al. (2023) identified narrative games as generally more successful in attitude change. The meta-analysis by Kolek et al. further identified meaningful feedback and stereotyping as efficient persuasive game mechanics.

We choose the attitude-bearing, and thus the adaptive game elements, to be a) in-game goals (meaningful feedback); b) narrative messages; and c) UI highlights. Future work could include the addition of in-game dialogues or stereotyping of customers and rival companies.

We have decided to adapt the chosen elements in two ways – either alter their content or not include them in the game at all. For example, in the case of in-game goals, a bonus task to deliver a certain percentage of orders using electric vehicles may appear. The player would receive extra income for completing the task. To weaken the persuasive strength, we can omit the task altogether. To boost the persuasive strength, we might change the task so that the player gets penalized if the task is not completed successfully.

In the case of UI highlights, let us use the post-level report as an example. Here, we can include or hide a section about savings on money and CO_2 emissions thanks to electric vehicle usage.

Regarding the intensity of the attitude-bearing content, we use three levels for the pilot experiment. The levels are as follows:

a) **Max:** The content strongly promotes electric vehicles (e.g., the player gets penalized if electric vehicles are not utilized enough, or a mechanic in the garage tells the player that combustion engine cars are outdated).
b) **Mid:** The content lightly pushes the player to give electric vehicles a try to see their advantages (e.g., the player gets rewarded for using electric vehicles, or a mechanic tells the player to try using electric vehicles since they are cheaper to operate).
c) **Low:** The content very slightly hints at the advantages of electric vehicles to the player or presents great bonuses for using them (e.g., the player gets a huge reward for using electric vehicles, but the goal is optional, or a mechanic just slightly tosses in that the electric cars are cheaper to operate).

Future works may include more levels of attitude strength and adapting to specific topic concerns, i.e., focusing more on the issues of electromobility that the player is concerned about.

3.5 Experimental and Control Version of the Game

We have developed two versions of the game for our experiments. In the experimental (adaptive) version, the initial attitudes of players are considered, and the pacing of the game's attitude-related information adapts accordingly. If the initial attitudes of the player towards the topic are negative, the persuasive content of the game is tuned down (**Low** level from the previous section). If they are positive, the persuasive content is presented at full strength (**Max**). If they are mostly neutral, we present the **Mid** level of the content.

The control (static) version shows the attitude-related information without any adaptation to the players, always in full strength (**Max**).

Figure 2 shows an example of how the UI content is adapted. To tune down the persuasive content, a section of the report table, which contains information about the amount of money and the CO_2 emissions saved (the green one on the right), can be hidden (**Min**). On the other hand, if the persuasive content is shown at its maximum (**Max**), the section is present, the benefits are visually highlighted, and there is a hint emphasizing the advantage of electric vehicles.

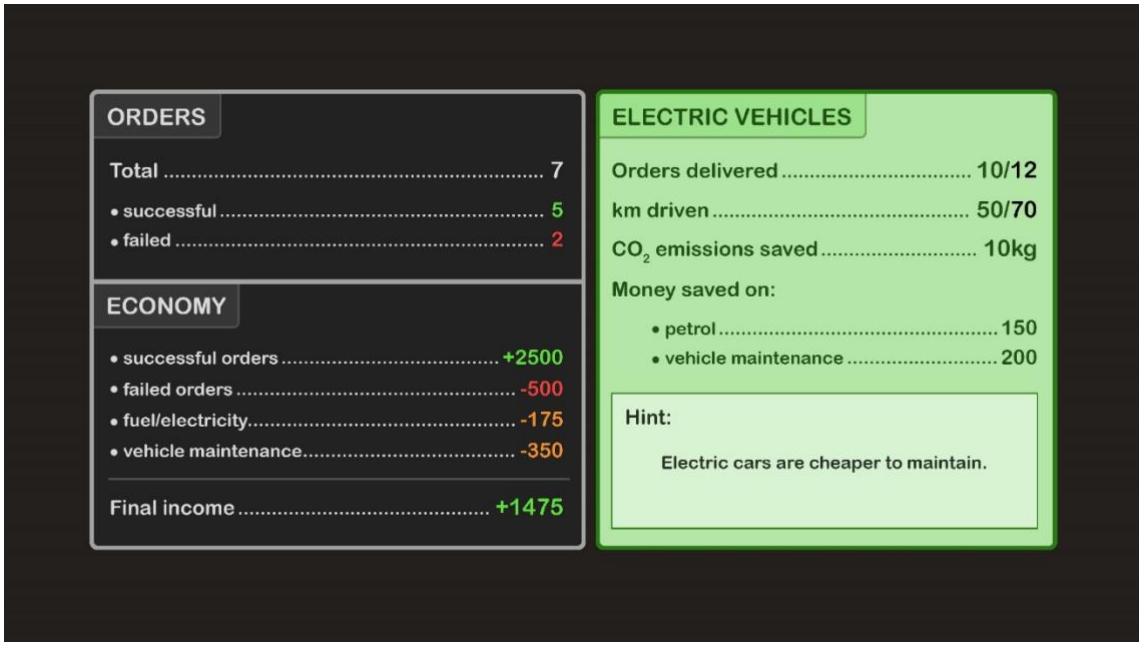

Figure 2: One of the adaptive elements is the user interface, which can adaptively show or hide a section of the post-level report that presents the benefits of using electric vehicles (the green one on the right).

Figure 3 shows the different information presented by the car dealership mechanic, an example of how the narrative messages that one can encounter are adapted. In a **Min** version (on the left), the mechanic provides an attitude-neutral tip for the game. In a **Mid** version (on the right), he tells the player about how he thinks that electric cars are the way to go.

Figure 3: The mechanic in the game's car dealership can provide the player with various tips, whose persuasive strength adapts to the player's initial attitudes.

Figure 4 shows how we adapt the attitude-bearing content of in-game goals. In the left example, the player is presented with a special subgoal to deliver a given number of packages using electric vehicles, which motivates the player to use electric vehicles, possibly even to buy more of them, as that might be required to fulfil the goal (this is a **Mid** setting of the persuasive content). In the example on the right, the player must use electric vehicles to avoid getting penalized (**Max** setting).

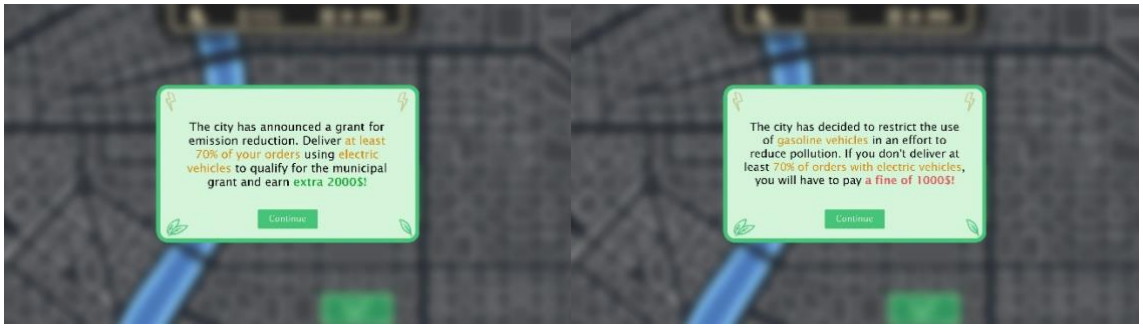

Figure 4: Examples of how the in-game goals adapt to player attitudes.

4. Experiment Design

This chapter describes the planned intervention and the tools we will use. We will introduce our target participants and the experimental and control intervention design.

4.1 Participants

For the pilot experiments, we will gather participants among university students, who will be rewarded with a course credit for their participation. Further experiments might include paid respondents. As we will be testing for the difference between our experimental and control intervention, we set the optimal sample size of each group to 64. Such a number of participants is required to show a medium (Cohen's d = 0.5) between-group difference in effect size in attitude change, given a two-sample t-test with a significance level α set to 0.05 and power 1–β set to 0.80.

4.2 Measures

All of our measures will be collected electronically, as the questionnaires will be included in the game application. We combine self-reporting with the Implicit Association Test (IAT) (Greenwald, McGhee, and Schwartz, 1998), which is less susceptible to faking or self-presentation, because it is based on response time measurements.

Participants' explicit attitudes will be tested with self-reported questionnaires using 5-point Likert scales (Likert, 1932) (e.g., "Electric vehicles are cost-effective alternatives to traditional gasoline-powered vehicles.") and Semantic differentials (Osgood, Suci and Tannenbaum, 1957) (e.g., "How do you view the cost-effectiveness of electric vehicles compared to traditional combustion engine vehicles?" with a 5-point scale between two opposite adjectives: "Expensive" and "Cost-effective"). Both of these questionnaires will consist of 5 questions.

Implicit attitudes will be tested using IAT (e.g., tasking participants with pairing electromobility with positive attributes and combustion engine vehicles with negative attributes, then reversing the task). Participants' background information will be collected, including gender, age and the highest level of education. Participants' enjoyment will be measured using the Game User Experience Satisfaction Scale (Phan, Keebler and Chaparro, 2016).

4.3 Procedure

Figure 5 shows the experiment's procedure. We will first collect data about implicit and explicit attitudes. Implicit attitudes will be measured first because they are context-dependent. Then, we will collect basic demographic data and randomize our participants into experimental and control groups.

During the intervention, they will play the adaptive (experimental group) or the static (control group) version of the game for approximately 30-40 minutes. After that, we will collect data on implicit attitudes, explicit attitudes and enjoyment (GUESS). After the posttest, we will debrief the participants.

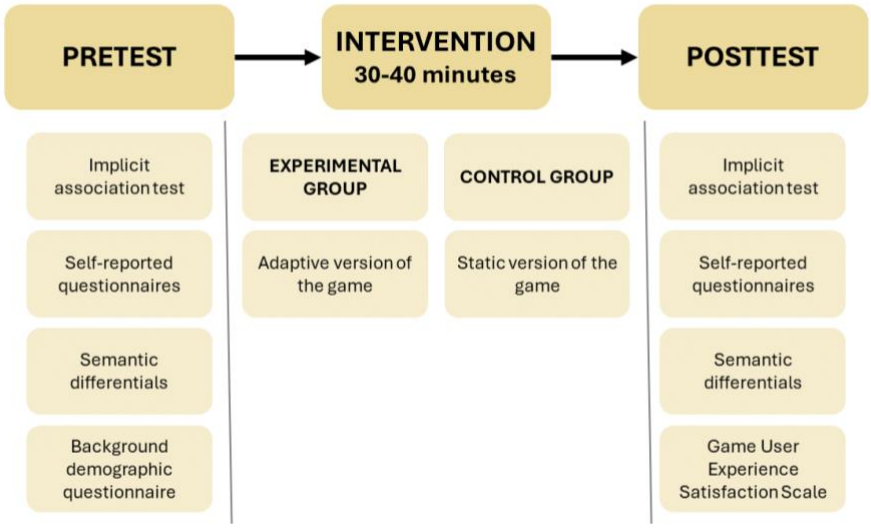

Figure 5: The experiment procedure.

4.4 Data Analysis

We will use two-sample *t*-tests to compare the two groups (experimental and control) in pre-post changes. Next, we will use regression models to analyse the influence of respondents' characteristics on their post-intervention attitude and enjoyment scores.

We will analyse the differences in attitude changes between the experimental and the control version to investigate whether adaptive content is more effective in influencing players' attitudes than static content. We will also examine the difference in enjoyment between the groups to answer our hypothesis that the adaptive version of the game will be more enjoyable.

5. Conclusion

We have identified a research gap in the game-based learning area regarding adapting a serious game's persuasive content to players' initial attitudes. Based on data available about credibility bias, motivated reasoning and games' effects on attitude change, we have designed the first study to validate the usability of adaptivity based on initial attitudes for improving the attitude-shaping effects of games.

Our approach was to choose a game genre that makes it possible to incorporate a wide range of adaptive game elements, which will allow us to validate out hypotheses. We selected a topic that ensures varying opinions among our target group, and we created the first game design approaches for implementing adaptivity in a game for attitude change. The study aims to bring unique insights to the whole game-based learning field.

5.1 Scalability and Future Research

The main goal of this study is to examine the effects of adapting all of the persuasive narrative elements present in the experimental game. Should the initial empirical data support our hypotheses, we will conduct further studies aimed at examining which game elements have the greatest effect. This will subsequently help to adapt this approach to other game genres, topics, and for respondents with varied demographic backgrounds. We aim to validate the approach's usability for both educational and commercial games.

To allow the usage of the adaptive methods designed for this study with other topics and game genres, we have strived to select the most common game elements as the adaptive ones to maximize the chance that the same game elements will be testable in other genres. Further, the adaptive mechanisms that we have developed, including narrative messages, user interface highlights, and in-game goals, are modular by nature, and it should be easy to integrate them into various game genres and thematic areas.

Acknowledgements

The work was supported by the grant SVV–2023–260699.

References

Allied Market Research (2022). "Game-Based Learning Market Research", [online], https://www.alliedmarketresearch.com/game-based-learning-market.

Bjørner, T. (2023). "Using EEG data as Dynamic Difficulty Adjustment in a serious game about the plastic pollution in the oceans", *In Proceedings of the 2023 ACM Conference on Information Technology for Social Good*. Association for Computing Machinery. 6–15.

Braddock, K., & Dillard, J. P. (2016). "Meta-analytic evidence for the persuasive effect of narratives on beliefs, attitudes, intentions, and behaviors", *Communication Monographs*, 83(4), 446–467.

Brannon, L. A., Tagler, M. J., & Eagly, A. H. (2007). "The moderating role of attitude strength in selective exposure to information", *Journal of Experimental Social Psychology*, 43(4), 611–617.

Epley, Nicholas & Gilovich, Thomas. (2016). "The Mechanics of Motivated Reasoning", *Journal of Economic Perspectives*. 30.

Flanagin, A.J. and Metzger, M.J. (2020). "Source Credibility", *In The International Encyclopedia of Media Psychology*.

Gawronski, B., & Brannon, S. M. (2019). "What is cognitive consistency, and why does it matter?", *Cognitive dissonance: Reexamining a pivotal theory in psychology*. American Psychological Association. 91–116.

Gawronski, B. (2022). "Attitudinal effects of stimulus co-occurrence and stimulus relations: Paradoxical effects of cognitive load", *Personality and Social Psychology Bulletin*, 48(10), 1438–1450.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). "Measuring individual differences in implicit cognition: the implicit association test", *Journal of personality and social psychology*, 74(6), 1464–1480.

Hefner, Dorothee & Klimmt, Christoph & Vorderer, Peter. (2007). "Identification with the Player Character as Determinant of Video Game Enjoyment", *Entertainment Computing - ICEC 2007*. 4740. 39-48.

Hooshyar, Danial & Malva, Liina & Pedaste, Margus & Wang, Minhong & Lim, Heuiseok. (2021). "An adaptive educational computer game: Effects on students' knowledge and learning attitude in computational thinking", *Computers in Human Behavior*. 114.

Hütter, M. (2022). "An integrative review of dual- and single-process accounts of evaluative conditioning", *Nature Reviews Psychology*. 1. 1-14.

İskender, Özlem. (2023). "Identification with Game Characters: Theoretical Explanations, Predictors, and Psychological Outcomes", 15.

Kabudi, Tumaini & Pappas, Ilias & Olsen, Dag. (2021). "AI-enabled Adaptive Learning Systems: A Systematic Mapping of the Literature", *Computers and Education: Artificial Intelligence*. 2. 100017.

Kolek, L., Šisler, V., Martinková, P., & Brom, C. (2021). "Can video games change attitudes towards history? Results from a laboratory experiment measuring short-and long-term effects", *Journal of Computer Assisted Learning*, 37(5), 1348-1369.

Kolek, L., Ropovik, I., Šisler, V., van Oostendorp, H., & Brom, C. (2023). "Video games and attitude change: A meta-analysis", *Contemporary Educational Psychology*, 75, 102225.

Kolek, L., Martinková, P., Vařejková, M., Šisler, V., & Brom, C. (2024). "Is video games' effect on attitudes universal? Results from an empirical study comparing video games' impact on the attitude change of players with different backgrounds", *Journal of Computer Assisted Learning*, 40(2), 667–684.

Likert, R. (1932). "A technique for the measurement of attitudes", *Archives of Psychology, 22 140,* 55.

Muriel, D., & Crawford, G. (2018). *Video games as culture: Considering the role and importance of video games in contemporary society.* Routledge.

Orji, Rita & Vassileva, Julita & Mandryk, Regan. (2014). "Modeling the efficacy of persuasive strategies for different gamer types in serious games for health", *User Modeling and User-Adapted Interaction*.

Orji, Rita & Mandryk, Regan & Vassileva, Julita. (2017). "Improving The Efficacy Of Games for Change Using Personalization Models", *ACM Transactions on Computer-Human Interaction*. 24. 32.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1957). *The measurement of meaning*. University of Illinois Press. Phan, Mikki & Keebler, Joseph & Chaparro, Barbara. (2016). "The Development and Validation of the Game User Experience Satisfaction Scale (GUESS)", *Human Factors: The Journal of the Human Factors and Ergonomics Society*. 58.

Pornpitakpan, C. (2004), "The Persuasiveness of Source Credibility: A Critical Review of Five Decades' Evidence", *Journal of Applied Social Psychology*, 34. 243-281.

Pratkanis, A. R. (1989). "The cognitive representation of attitudes", *Attitude structure and function.* 71–98. Lawrence Erlbaum Associates, Inc.

Ratcliff, Chelsea & Sun, Ye. (2020). "Overcoming Resistance Through Narratives: Findings from a Meta-Analytic Review", *Human Communication Research*. 46.

Smethurst, T. & Craps, S. (2014). "Playing with Trauma: Interreactivity, Empathy, and Complicity in The Walking Dead Video Game", *Games and Culture*. 10. 269-290.

Spohr, D. (2017). "Fake news and ideological polarization: Filter bubbles and selective exposure on social media", *Business Information Review*, 34(3), 150-160.

Tussyadiah, Iis & Dan, Wang & Jung, Timothy & Tom Dieck, M. Claudia. (2018). "Virtual Reality, Presence, and Attitude Change: Empirical Evidence from Tourism", *Tourism Management*. 66. 140-154.

van Strien, J. L. H., Kammerer, Y., Brand-Gruwel, S., & Boshuizen, H. P. A. (2016). "How attitude strength biases information processing and evaluation on the web", *Computers in Human Behavior*, 60, 245-252.

Vogel, T., & Wänke, M. (2016). *Attitudes and attitude change* (2nd ed.). Routledge/Taylor & Francis Group.