DIGITAL HEALTH GAME ON CERVICAL HEALTH AND ITS EFFECT ON AMERICAN WOMEN'S CERVICAL CANCER KNOWLEDGE

A Thesis

Presented to

the Faculty of the Department of Computer Science

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

By

Rohit Nirmal

May 2013

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Rohit Nirmal

APPROVED:

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Dr. Olin Johnson

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Dr. Chang Yun

_____

Dr. Jenny Yi

_____

Dean, College of Natural Sciences and Mathematics

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ABSTRACT

Game-based learning (GBL) remains an exciting idea in the realm of serious games, with hopes that games can be used as educational tools that would be supplemental to or even replacements for traditional ways of learning. We wanted to scientifically investigate if a game that teaches women about HPV and cervical cancer would be more effective in serving the interests of public health than pamphlets and websites dedicated to teaching the topic.

We also wanted to know if such a game was equally effective to the non-English speaking segments of the U.S. population, and translated the entire game into Vietnamese and Korean in order to see if women of these groups also equally benefitted from playing the game and if they were more knowledgeable about the topic after playing the game. After developing this game, we invited 111 people who speak English, Vietnamese, and Korean to play the game on our computer. We analyzed the feedbacks the participants gave us to arrive at conclusions regarding the effectiveness of using educational games to disseminate health information.

Analysis of survey results indicate that an overwhelming majority of participants learned a little or a lot about the two diseases from playing this game and thought that this game would be preferred to traditional methods in teaching about the subject matter. Also a large majority of participants had fun playing the game and also said that the translations in Korean and Vietnamese were acceptable. The survey suggests that e-games are at least as effective a method for teaching as traditional methods. More

research and evidence is needed to establish whether e-games are equally or more effective at teaching compared to traditional methods like pamphlets and static web pages.

It should also be noted that while a noticeable minority of women learned only a little or had only some fun with the game, nearly all participants agreed that an e-game was a viable if not a superior alternative to traditional means of learning about the topic.

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1 Introduction

Despite the popularity of computer and video games caused primarily by their perceived value as unabashed entertainment and escapism, for the past many years, there have been attempts to take them into more serious directions with varying degree of success. We wish to pursue one popular area in the movement of "serious games", which is educating the user in a profound way about an important and relevant medical topic.

Anyone who had been enrolled in a public elementary school since they were equipped with computer labs, will likely have memories of playing some educational game during lab time. While these sessions were a chance for students to gain valuable computer literacy skills, they were also made to allow them to learn about a topic in a fun and engaging way outside of the traditional curriculum of lessons and tests. This was done with the belief that such time spent with the computer was in some ways a superior way of teaching people compared to traditional methods. While the mixing of entertainment through computer games with education as a way of improving its results is not new, as is evident from the existence of games like *Oregon Trail* and *Math Blaster* in the 1980s and 1990s, there have been fewer attempts to use games as vehicles for social good, where they can champion public awareness projects regarding social or medical issues.

In a time after it has been decided by the U.S. Supreme Court that computer and video games deserved First Amendment protection just as books, music, and movies do, we decided that video games deserve a chance to prove themselves to be used to educate

society about important topics in unique ways through real and proven data. For this experiment, we chose Human Papillomavirus (HPV) and cervical cancer as worthwhile topics to address. Even though we chose a medical topic, the efficacy of video games to educate the general public in other non-medical topics, e.g. financial, political, or religious, can be derived from this project.

2 Background

Let us discuss why we chose HPV and cervical cancer as the topic of our game. The main reason is that these diseases have reached epidemic proportions in the United States, especially among younger women due to lack of knowledge about these diseases and also due to increased sexual activity amongst younger women and men. Cervical cancer, which is caused mostly by HPV, is a preventable disease among women that can lead to death if not quickly treated.

While the use of Pap smears and HPV vaccines have been instrumental in detecting and fighting off HPV and cervical cancer in developed countries, there remains a widespread ignorance of the cause, symptoms, and extent of cases of HPV and cervical cancer in many communities, despite the proven statistics that indicate how widespread it is.

This lack of awareness caused by failure of mass communication cannot always be written off as a sad coincidence. The truth is that in some cultures and communities, it is the result of conservative attitudes towards sexually transmitted diseases such as HPV

that hushes conversation about it and the symptoms it causes, which leads to unnecessary infections and deaths.

The obvious method of combating this unfortunate trend is to educate the broad masses of people, especially younger women about what causes HPV and cervical cancer, how to prevent them, and how to treat them. Depending on the person who is being taught, such education will likely encourage her into getting screened for HPV at an early age through the use of Pap smears, and to get vaccinated from HPV. Currently, the method of conveying this information is the same as how most educational initiatives about a social problem are - physical pamphlets, public service announcements, and the internet, where the user passively receives all information.

Despite having these helpful resources available, we investigated if video games, with all of the interactivity and entertainment that they provide, could give a superior learning experience compared to the traditional ways about learning about such issues in which one purely absorbs facts and information, while also ensuring that said information is remembered long after the game has been played.

2.1 Why HPV and Cervical Cancer

In this section we discuss the reason for choosing HPV and cervical cancer as the topic for our educational game. This requires an explanation as to what these diseases are, how they are contracted, and why they are important for all people to know about.

2.1.1 What is Genital HPV Infection?

Genital Human Papillomavirus is the most common sexually transmitted infection (STI). There are more than 40 HPV types that can infect the genital areas of males and females, as well as the mouth and throat. HPV is not the same as herpes or HIV (the virus that causes AIDS) – while these are all viruses that can be passed on during sexual intercourse, they are responsible for different symptoms and health problems.

Human Papillomavirus (HPV) affects both females and males. HPV transmission can happen with any kind of genital contact with someone who has HPV—intercourse isn't necessary. Most people who have HPV don't even know that they do, because the virus often has no signs or symptoms, meaning that one can get the virus or pass it on to their partner without knowing it.

In the United States, an estimated 75% to 80% of males and females will be infected with HPV in their lifetime. For most, the virus will clear on its own, but when it doesn't, HPV can have serious consequences.

2.1.2 A Sexually Transmitted Epidemic

It is estimated that approximately six million new HPV infections are acquired each year in the United States alone, and prevalence data suggest that as many as twenty four million American adults—that is, one in five —may be infected with HPV. In the population most at risk, those of reproductive age, as many as 75% may have been infected with genital HPV [2.1].

So, HPV is the most commonly acquired sexually transmitted viral infection in the United States. [2.1] [2.2] Recent estimates of the yearly cost for treating HPV and related diseases, including cervical cancer, exceed $4.5 billion, more than the cost of any other single sexually transmitted infection with the exception of HIV. [2.3]

Long before the AIDS crisis, warnings about epidemic HPV were being sounded. In 1954, military physicians first alerted the American medical community to the venereal transmission of genital warts. Soldiers returning from duty in the Far East had contracted penile warts there, and similar lesions were now developing on their wives genitalia. [2.4] Cervical cancer is now the first or second most common cause of cancer deaths among women throughout much of the developing world. [2.5]

2.1.3 How People Get HPV and Outcomes of HPV

HPV is passed on through genital contact, most often during vaginal and anal sex. HPV may also be passed on during oral sex and genital-to-genital contact. HPV can be passed on between straight and same-sex partners—even when the infected partner has no signs or symptoms.

A person can have HPV even if years have passed since he or she had sexual contact with an infected person. Most infected persons do not realize they are infected or that they are passing the virus on to a sex partner. It is also possible to get more than one type of HPV.

Rarely, a pregnant woman with genital HPV can pass HPV to her baby during delivery. Very rarely, the child can develop juvenile-onset recurrent respiratory papillomatosis.

Below are some facts about HPV types to keep in mind.

- HPV Types 6 and 11 cause about 90% of *genital warts* cases in females and males.
- HPV Types 16 and 18 cause about 75% of *cervical cancer* cases in females.
- HPV Types 16 and 18 also cause about 70% of *vaginal cancer* cases and up to 50% of *vulvar cancer* cases in females.
- All HPV types that affect the genital area can cause abnormal *Pap tests* in females.

2.1.4 Cervical Cancer

Cervical cancer usually does not have symptoms until it is quite advanced. For this reason, it is important for women to get regular screening for cervical cancer. Screening tests can find early signs of disease so that problems can be treated early, before they ever turn into cancer.

Each day in the United States, 30 women are diagnosed with cervical cancer (about 11,000 women per year) and 11 women die from it. Cervical cancer is cancer of the cervix (the lower part of the uterus that connects to the vagina). *Unlike other cancers, cervical cancer is not considered to be passed down through family genes.* Cervical cancer is caused by certain types of HPV (Human Pappilomvirus.)

When a woman is infected with certain types of HPV, and the virus doesn't go away on its own, abnormal cells can develop in the lining of the cervix. If these abnormal cells are not found early and treated, precancers and then cervical cancer can develop.

2.2 Related Work

While educational computer and video games have been created and used for years, many of them are made to teach simple academic subjects to children or highly-specialized job-related skills to adults. Other games, such as *Democracy* [2.6] and *Miniconomy* [2.7] do teach the player about important topics such as government and economics, however. While games that primarily teach about health are intended mostly for children, other game software for adults act as little more than digital encyclopedias that are not fun to play.

There are many serious games developed as health interventions, a number of which have been shown to be effective [2.8] [2.9] [2.10] [2.11] in teaching users about various medical topics. Most of these games are focused on helping players gain more knowledge about certain diseases or their health conditions. However, none of these deals specifically with HPV and cervical cancer as our game does especially in Korean and Vietnamese languages.

Dr. Sylvia Todescan, et al, in her paper, "Increasing New Faculty Teaching Effectiveness through Gaming Strategies: Tips, Tools, and Resources" has given a comprehensive treatment of games as educational tools for medical education. [2.12] She

has dealt with topics such as the basic characteristics of a game, game types and categories, examples of educational games, and games in health education. However unlike our paper, her paper does not deal with developing an actual game in multiple languages and obtaining feedback from players.

The website www.boardgaming.com lists many board games, some of which are educational. However, on these websites too we did not find any game that is like ours. There are also many free medical games that one can play online such as those from the Philips Learning Center [2.14]. However most of the games, though educational, lack the entertainment quality and are not immersive in nature. In contrast our game is educational, entertaining, and immersive.

Kron, et al, interviewed 217 medical students about the efficaciousness of educational video games [2.15]. They concluded that, "Overall, medical student respondents, including many who do not play video games, held highly favorable views about the use of video games and related new media technology in medical education." Again unlike our efforts, they have not developed a serious game in multiple languages and have not surveyed the players about the efficaciousness of such a game.

3 Game Design Strategies and Concepts

Before designing our board game, we studied the literature of games to learn about the rules for game design. We wanted to keep the established rules in mind while designing and developing our game, so that players already familiar with the fundamentals of

traditional board games would easily pick ours up with little resistance. In this chapter we mention some cardinal rules for designing serious games.

3.1 Norman's "Basic Requirements"

Frazer in his doctoral thesis [3.1] mentions Norman's "Seven Basic Requirements" of serious games [3.2]. Some of these requirements mentioned by him are as follows.

- **Provide a high intensity of interaction and feedback**. This is needed for the learner to successfully alter their actions based on progress within the environment. Without feedback, the user might not notice any mistakes they are making; without sufficient interactivity, the environment will be unable to generate enough useful feedback with which to guide the user.

- **Have specific goals and established procedures.** Goals are useful, as they provide learners with something to aim for. Without established procedures, the student may become frustrated in trying to determine the methods used by the system.

- **Motivate**. If the learner is motivated, they are more likely to drive themselves through the learning process without the need for external encouragement.

- **Provide a continual feeling of challenge that is neither so difficult as to create a sense of hopelessness and frustration, nor so easy as to produce boredom.** This ensures the learning process targets the learner's exact needs and abilities, keeping them motivated by balancing between boredom and frustration.

- **Provide a sense of direct engagement.** The game should produce the feeling of directly experiencing the environment, directly working on the task. Provide appropriate tools that fit the task so well that they aid and do not distract. Avoid distractions and disruptions that intervene and destroy the subjective experience.

- **The designer should strive to promote an immersive learning environment**. By immersing themselves fully, the learner can absorb information from their own experiences, rather than from instruction. If the immersion is interrupted, the learner's experience will be less effective [24], making it important to use tools and techniques which maintain the immersion.

3.2 Keller's "ARCS" Method

The importance of motivation is further illustrated by referring to M. Keller's 'ARCS' method [3.3].

- **“Attention strategies"** are meant to arouse and sustain curiosity and interest of the player. This is because if the environment generates curiosity, learners will be more motivated to explore by themselves.

- **“Relevance strategies"** are important because they link to the learners' needs, interests, and motives. When clearly-defined goals are linked to the learner's own learning interests, the learner becomes more motivated to pursue those goals, and learns more about the subject as a result. For our game, learning about HPV and cervical cancer as well as how to protect ourselves from them is considered relevant to the player.

- **“Confidence strategies"** help students develop a positive expectation for successful achievement, which requires designers to balance the learning experience so as not to make the experience too easy or difficult. Giving positive reinforcement, such as playing the right sound effect when picking up coins or showing a green checkmark when getting a question right are other examples of confidence strategies that make it enjoyable for users to play a game.

- **“Satisfaction strategies"** provide extrinsic and intrinsic reinforcement for effort. Learners become more motivated to pursue a goal if achieving it will result in some kind of reward. Besides learning about an important topic, players of our

game should enjoy competing against other players to demonstrate who has the most knowledge about HPV and cervical cancer.

3.3 The Behaviorism Concept

Behaviorism states that when a behavior is reinforced by positive consequences (a process known as “conditioning"[3.4] the subject is more likely to repeat it in the future. In this way, “learning" is the increase in probability of a behavior based on past reinforcements, such that antecedents include the consequences of the learner's previous actions.

This type of reinforcement is often present in computer games, such as when a player is rewarded for performing an action correctly and is given compensation such as progress or resources in return – in order to continue this cycle, these rewards can help the player move forward past newer obstacles. For example, in the game *Monopoly*, the player can take certain steps to obtain money from other players, which they can then use to finance other operations in the game they need to ultimately win.

Figuring out the “reinforcement schedule” – the rate at which rewards are given – is important to a game’s design because it can directly affect a player’s motivation to continue. If the rewards come too rarely, require too much effort or are not enticing enough, the player will lose motivation to continue playing, seeing that they are spending more time “working” for the game’s systems rather than enjoying the benefits that they provide. On the other hand, if these rewards come too rapidly or offer too much of an gameplay advantage, they will likely be quickly abused by the player, whose concern

becomes only “winning” the game rather than enjoying the moment-to-moment interaction with its systems – the game becomes a “Skinner Box” rather than a fun experience.

This pitfall is especially perilous to an educational game, where the primary motivation is to learn about the topic – if the designer is not careful, the player will completely ignore what is being taught, or only pay enough attention perform the least amount of steps in order to “beat” the game. Another outcome of an imbalanced reinforcement schedule is that too many rewards will make the game too easy, eliminating the player’s motivation as the effort required to obtain rewards is also removed from the equation.

3.4 Gagne's Nine Steps of Instruction

Gagne identified the following nine steps involved in successful instruction [3.5]. While originally taken from traditional learning activities, the steps can be applied to the way in which many modern games teach players to play. The steps are as follows:

1**. Gain attention**. While one may take comfort in the fact that the player has already chosen to sit at their computer and start the game, this is not enough to assume it has their attention – it must also entice them to continue playing from the very beginning. For an educational game, the player should be having fun very quickly before they begin to learn whatever is being taught. For our game, we allow players to transition to the main play screen very quickly while also offering the basic rules on how to win so that the player wastes no time before potentially getting distracted or impatient.

2**. Inform learner of objective**. Goal provision is a key element of good game design, and is reflected in this stage of Gagne's list. The player may be informed of the long-term goal of the game, the short-term goals of the current level, or immediate goals of the current task in hand. Regardless of the type of goal, the player should be made well aware of it if they are to be expected to a achieve it. For our game there is one short-term goal and one long-term goal – get coins to take Fact/Myth tests, and get Fact/Myth cards to win the game. Both of these goals are found in the game's help menu as well as in

3. **Stimulate recall of prior information**. An initial training level could be used here, encouraging the use of transferrable skills from other games of the same genre. Because we are making a digital board game, we use familiar graphics such as dice and tiles in order to remind the player of any real board games they may have played.

4. **Present new information**. With the player now able to replicate these "standard", genre-wide techniques within the current context, the game can begin to demonstrate interactions specific to the game itself. For our game, we have tiles that the players land on to gain or lose coins that affect their ability to take Fact/Myth tests, a mechanic specific to this game.

5. **Provide guidance**. Having alerted the player to these new possibilities, the next step is to explain how they work. This could be a simple matter of explaining the required input

controls, or having another in-game character demonstrate the action for the player to replicate later. Again, our game offers full instructions in the help screen as well as the basic requirements to win the game in the main playing screen.

6. **Elicit performance**. Now that the player theoretically understands how to carry out the new action, the game should ask them to prove this. In the early stages of the game, this should typically be in a contrived “training" situation, with little opposition other than from the task itself. Our game does not have a specific situation as it is risk-free to begin with. However, the player may still choose to compete against computer opponents in order to learn how the game works before playing with real people.

7. **Provide feedback**. Having attempted to demonstrate their ability, the game informs the player of their immediate success or failure. Audio and visual cues are typically used here, showing players whether they have hit targets, built in the correct place, driven along the correct route or performed the correct combination of button presses. Our game gives feedback when the player receives coins and when they get a Fact/Myth test right or wrong.

8. **Assess performance.** This works alongside the provision of feedback. Once the player has successfully accomplished the tasks set by the game, they will be free to continue onto the next stage. If they fail to perform satisfactorily, the game may hold them back and explain where they went wrong, asking them to repeat the task until they can

complete it. While our games does not prevent poor players from continuing, it does give the correct answer to a question whenever they answer a Fact/Myth test, explaining why their choice was right or wrong.

9. **Enhance retention and transfer**. Once the player has demonstrated their ability to perform these tasks successfully, the game will offer situations similar to the ones encountered during training, forcing the player to re-use their existing skills in new contexts. Because our game has more questions than players will likely see in one play session, they can continue playing and use what they have learn throughout multiple playthroughs.

As the above nine steps (or sub-sets of them) are repeated throughout the game, the new skills learned will need to be combined with those already understood, again encouraging the player to use their skills within new contexts.

3.5 Importance of Immersion

Keeping the player fully engaged in their experience is widely regarded as a holy grail of game design. The more a player is swept up in the game, the more they are enjoying – and in the case of an educational game, learning. On the contrary, anything that would break this immersion, such as a sudden change in difficulty or rules, would hurt the player's fun and education. Because our game is competing against traditional means of learning such as Internet web pages and pamphlets, we are confident that we have made something more immersive and enjoyable to use.

3.6 Maintaining Balance

Another inherent feature of gaming is the way in which difficulty is balanced. As a player progresses through the game, having demonstrated proficiency in the required skills, their experience will become gradually more challenging. The timing and gradient of this increase is critical to the gameplay experience [3.6]. If it happens too soon, or at too rapid a rate, the player will not be skilled enough to overcome the current challenges, and will be unable to progress further through the game.

If the difficulty increases too slowly or too late, the player may become bored at the lack of challenge, and will lose motivation in achieving their goals. By maintaining this balance of difficulty, players remain engaged in pursuit of their goals and are more committed to following the game through to the end.

Rollings and Adams state that balancing a game is “an optimization problem in n-dimensional space, where n is a very large number" [3.7]. When using a “tweak-play-tweak" method however, a number of different attributes can be altered to maintain a suitably balanced challenge. The number of opponents may be increased or reduced, as may their proficiency in challenging the player. Weapons or tools used to compete against them may be made more or less effective, or resources made more plentiful or scarce. Traditionally, these variables would be determined by a predetermined difficulty setting chosen at the start of the game. The higher the difficulty, the more numerous are the opponents, more scarce is the ammunition, and the more inaccessible is the environment.

However, using artificial intelligence (AI) techniques such as Reinforcement Learning [3.8] [3.9] and High-Fitness Penalizing [3.10], and developing technologies such as “Hamlet"[3.11], games will be able to adjust their difficulty in real-time, offering the more appropriately balanced experience. For example, if a player is having a hard time getting past a certain section of a First-Person Shooter, the game may increase the number of ammunition and health packs available, or cause the opponents to run out of ammunition themselves. Conversely, if the player is finding a section very easy, the game may compensate by sending in more opponents wearing thicker armor, or may lock the door the player wants to go through, forcing them to find a key.

This kind of dynamic difficulty setting would be ideal within a learning environment, with effects similar to those of a more traditional adaptive learning environment. If a learner proves to know enough about a certain subject, the system could skip ahead, assuming the student needs no further instruction in this area. On the other hand, if a student seems to be struggling in a given situation, additional help, explained at a more fundamental level could be provided, to help the student understand the information more easily.

Bailey and Katchabaw presented an experimental test bed to incorporate auto-dynamic difficulty adjustment into modern video games [3.12]. Their research indicates positive results, although further investigation with a more detailed game harness is required. They also propose a “proactive" dynamic difficulty engine, which establishes a player's ability from a number of non-critical in-game actions. This would have the added benefit of allowing the game to adjust the difficulty level before the player reaches any

critical game-play stages. This removes the extra, initial stage of frustration or boredom used to calibrate the existing “reactive" systems, making the experience even more tuned to the player's abilities.

3.7 Enhancing Curiosity

The provocation of curiosity is quite a common feature in many games, employed to force the player to make decisions. Common devices such as crates and barrels often contain rewards, encouraging players to look inside them at any opportunity. Distant platforms, locked doors and heavily guarded areas all suggest to the player that there must be something in these areas to warrant the added difficulty of reaching them.
By enticing the player to go further out of their way, or engage in otherwise unnecessary conflict, the player's curiosity is increased, driving them to make the most out of their gaming experience.

In an educational context, these kinds of lures could be used to encourage learners to further their own learning experience, without being constantly pushed by instructors. Malone suggests that in order to evoke curiosity within the player, the game should provide “an optimal level of informational complexity", such that the player “knows enough to have expectations", while making sure that the expectations aren't always met [3.13]. By making the player think that their current knowledge is “incomplete or inconsistent", the game encourages them to take actions to make their knowledge complete.

3.8 Facilitating Feedback

Opportunity for instructors to assess how well a student is performing are present in various degrees within computer gaming. At the very least, a player is typically presented with a “score" of some kind, providing a relative indication of performance compared to other participants. However, it is becoming more common for games to provide much more detailed accounts of what went on during play.

The online game “Halo 2" offered an extremely in-depth report on what occurred during a match, including the positions on the map where most combat occurred, the number and types of vehicles used by each team, and exact way-point indicators showing movements of key players. These increased levels of observational data should help paint a clearer picture of how a student performed, allowing more valid feedback to be generated.

In addition, it is quite common for games to offer action replay functionality, allowing others to observe a player's exact actions within a single game. This kind of functionality could prove invaluable to instructors wishing to provide feedback, as it could be generated based on precise viewings of replay data, then explained to the student whilst watching the replay.

4 The Game

In this project, we develop an actual educational game and present an alternative method of teaching people about a social and medical issue. Video and computer games are becoming an increasingly powerful medium for entertainment in modern society,

sometimes overtaking the sales of popular movies and books. Because they hold such great and positive attention in our culture and there is a proven track record of using them for educational purposes with success, we decided to create a computer game designed to teach the user about HPV and cervical cancer in a friendly and fun environment that encourages them to learn while being entertained.

We believe that this method of teaching is more likely to impact the user and to help them make good choices in being safe from these diseases, because they will not be bored by traditional means of teaching where they passively receive this education without pushing against anything that responds. Because of the unique interactivity of video games and their inclusion of win and loss states, our game would have to require even the player with the most knowledge of the topic to still take part in its systems before being able to win.

In order to make the game as effective at this goal of engaging the user as possible, we first studied the basic principles of game design to find the best way of teaching the user about our topic while ensuring they are having fun, as well as making sure that the game's systems are still very accessible. After this was done, a prototype was made in order to see if a subset of the final design could even be accomplished as a game and whether it accomplished the above goal.

The result of the work is as follows, with the game's main menu shown in Figures 4.1, 4.2 and 4.3.

Figure 4.1: The main menu of the game, in English

Figure 4.2 The main menu of the game, in Vietnamese

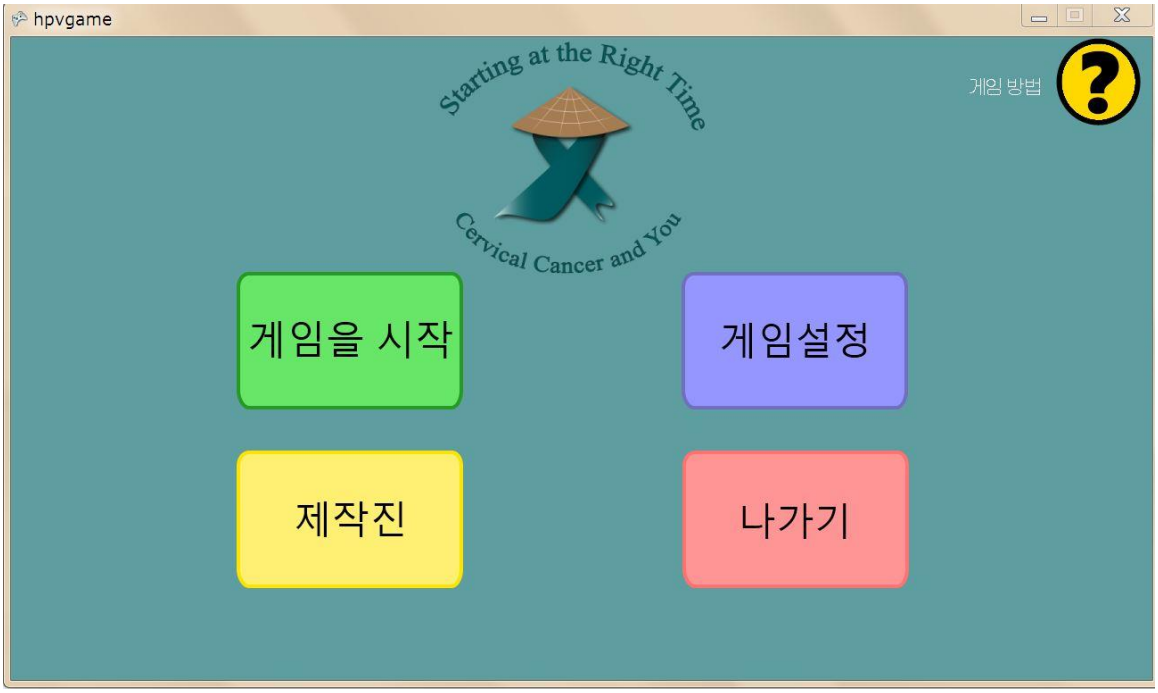

Figure 4.3 The main menu of the game, in Korean

4.1 Game Design

In order to make a game that would impact the most people as possible, some considerations had to be made for its design before development began in earnest. Despite the fact that we were making a video game and that it could be made into any established genre there is in the medium (of which there are many), we decided to be conservative in our preliminary design phase and chose a traditional board game setting as the primary system that the player would interact with. We decided on this for the following two reasons.

First, despite the larger popularity of many other genres of video games in mainstream entertainment, not all of them are easily recognizable or are as easy to understand and play for the average person who is not familiar with games. While younger people are more knowledgeable about video games and play them more often, we did not want to exclude older women from learning about this topic simply because they are not familiar with the specific medium that educates about it. We believed that even if a participant had played very few video games or none at all, they would still be familiar enough with the basic "language" of traditional board games – such as dice, turns, movement of pieces, and competition between the players who own those pieces – that they could quickly pick up on the additional rules of our game without questioning the fundamentals of how to interact with it.

Secondly, making a top-down, turn-based, and two-dimensional board game proved to be the fastest game to program, prototype, and develop, since creating artwork would only consist of using simple image editing software rather than modeling, while programming the game would not require the complex mathematics required of three-dimensional games nor the complexity of processing input of multiple players in real-time.

These two reasons why we chose this genre also helped us create an interface that is easy to use. Because the game is in 2D, we could easily create interface elements such as buttons and check boxes with which anyone who has used a computer with a graphical user interface (GUI) or a web browser is familiar. We also use visual and audio feedback

in the main menu of the game, such as having selected buttons come in to the foreground while others fade, and having a distinct sound when a button is clicked.

In order to change the language of the game, players can click on the blue "Configuration" button, where they are taken to a screen (shown in Figure 4.5) and can select from one of the three available languages. Upon making a selection, all text in the game is instantly changed to the selected language. Because the selection of a language involves only the changing of the value of a global variable in the code, the game can be easily extended to support even more languages later on.

If a player does not have anyone available to teach them the rules of the game and still wants formal instructions, they can easily do so by clicking on the yellow button with a question mark labeled "How to Play" in the main menu, (Fig. 4.1, 4.2, 4.3) which takes them to a separate screen that teaches them how to play the game through multiple pages. One of the help screens, shown in Figure 4.4, features screenshots and images taken directly from the game's files, allowing players all the time they need to see what they are about to interact with in a more relaxed environment without having to learn by performing trial and error maneuvering with the interface.

Figure 4.4 Page of help screen, in English

Because we decided on using a board game, a genre of games that calls for multiple people to play in the same space, we allow for up to four players at once during a gameplay session, which allows for people to compete against each other and have more fun while learning about the topic. In the event that someone still wants to learn about the educated topic but does not have anyone to play with, the game also allows for some avatars to be controlled by the computer itself to serve as a challenge, as shown in Figure 4.8.

Figure 4.5 The language selection screen, in English

Figure 4.6 The language selection screen, in Vietnamese

Figure 4.7: The language selection screen, in Korean

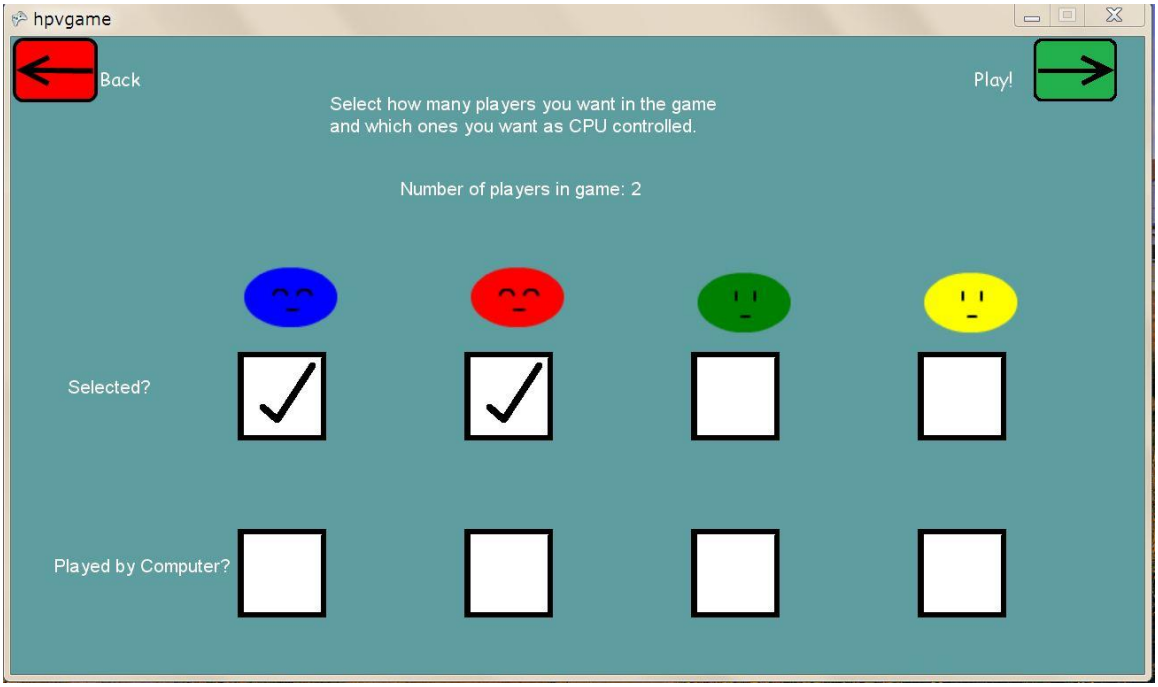

Figure 4.8: Player selection screen, in English

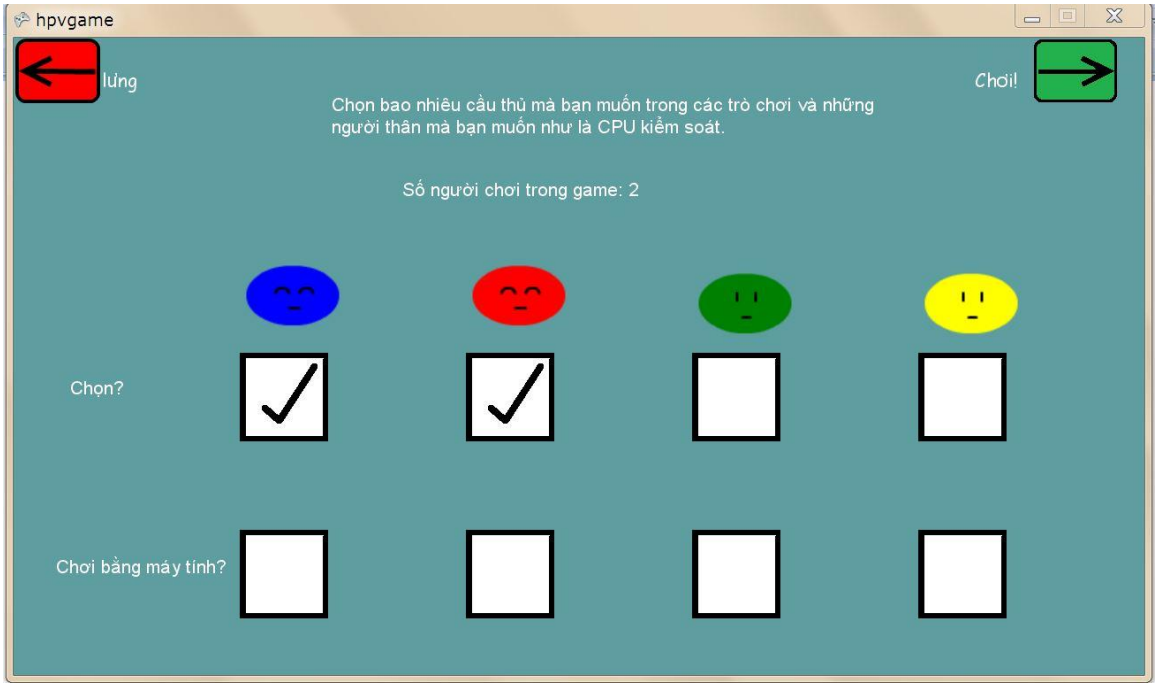

Figure 4.9: Player selection screen, in Vietnamese

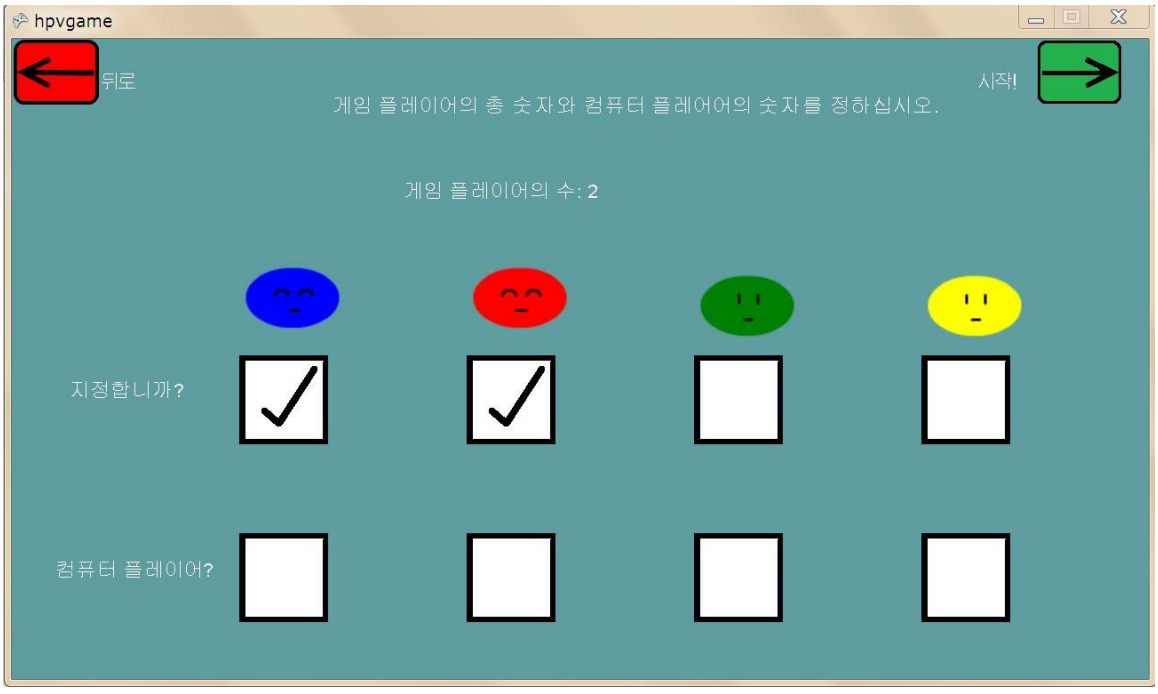

Figure 4.10 Player selection screen, in Korean

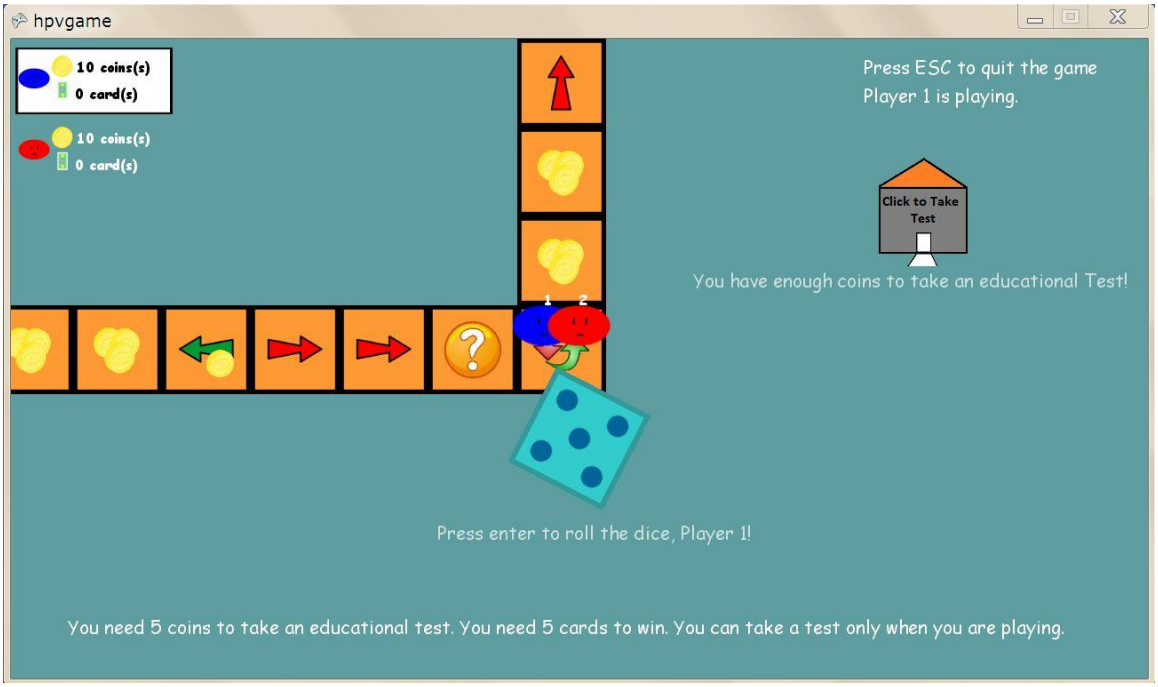

Figure 4.11: The main playing screen, in English

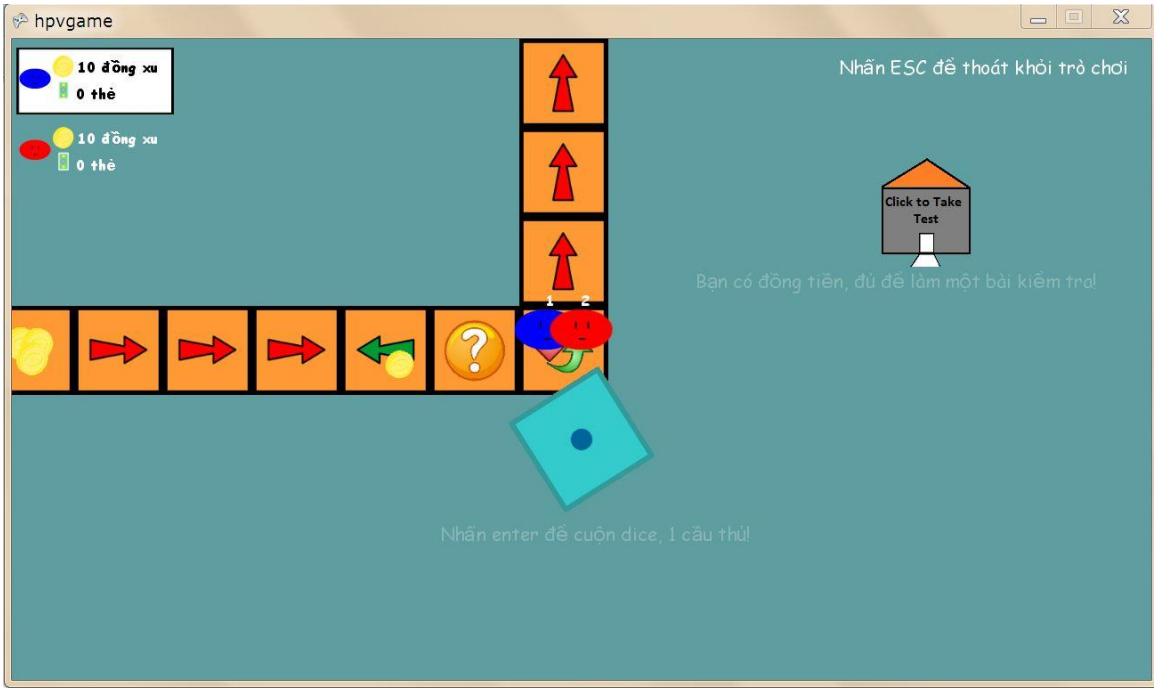

Figure 4.12: The main playing screen, in Vietnamese

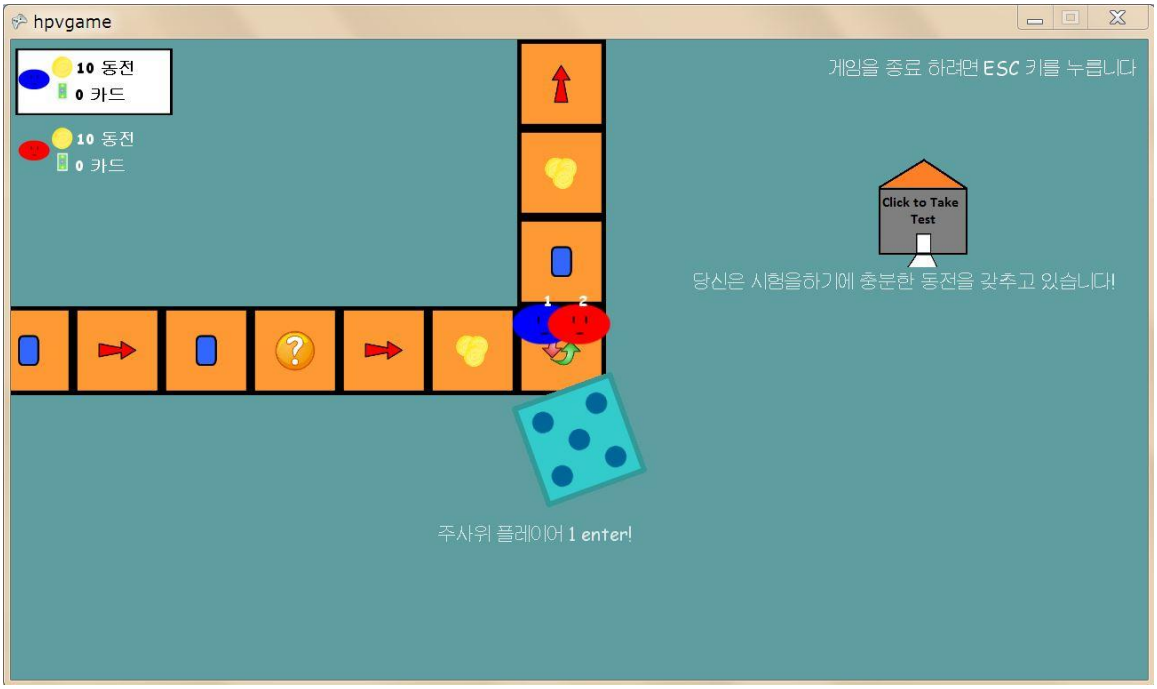

Figure 4.13: The main playing screen, in Korean

Once the user has designated the numbers of players that will be in the game and which of them (if any) will be controlled by the computer, they are finally sent to the game play screen (shown in Figure 4.11), where the basic interaction with the game is similar to what is in board games such as *Monopoly*. When the game first starts, all player avatars (a colored oval with a face, where each player has a different color) are located in one corner of the board (bottom right in the game), and the first player (designated Player One) has the first turn.

Each player can simulate a rolling of a dice by pressing *Enter* and move their avatar clockwise as many steps as there are on the dice, which is shown in the middle of the screen. After the player has landed on a tile and the appropriate event associated with that tile has occurred and fully played out, the game switches turns to the next player (Player

2, going up to Player 4). After the last player's turn has ended, the game returns control to Player One. In order for players to understand who is getting closer to the game's winning condition, each has two resources that must be managed carefully - coins and Fact/Myth cards, both of which are shown on the top left corner of the screen. Possessing one or more Fact/Myth cards indicates that the player has successfully demonstrated knowledge about HPV and cervical cancer in the game.

All players begin the game without any cards, and the first player who obtains five cards wins the game. In order to obtain a Fact/Myth card, players may take an "Educational Test" during their turn by using the mouse and clicking on a certain button that looks like a school. It is this test, shown in Figure 4.14, which demonstrates the educational qualities of the game – the player is given a random statement in the selected language about HPV or cervical cancer, and must decide if the statement is a myth or a fact, and click the appropriate button for their decision. If the player's choice is correct, they are awarded a Fact/Myth card. Whether or not the player is correct, the game will show an explanation of the statement after a decision is made, so that all players can learn why a statement was indeed a fact or a myth.

Because taking the test requires a payment of five coins each time, it is in the player's interest to obtain coins as quickly as possible and truly consider the choice they make during the test so as not to waste time and resources while their opponents could gain cards. Since all players begin the game with ten coins in their possession, they can take the test up to two times immediately during their first turn, so that they can quickly learn about the topic without having to roll the dice first.

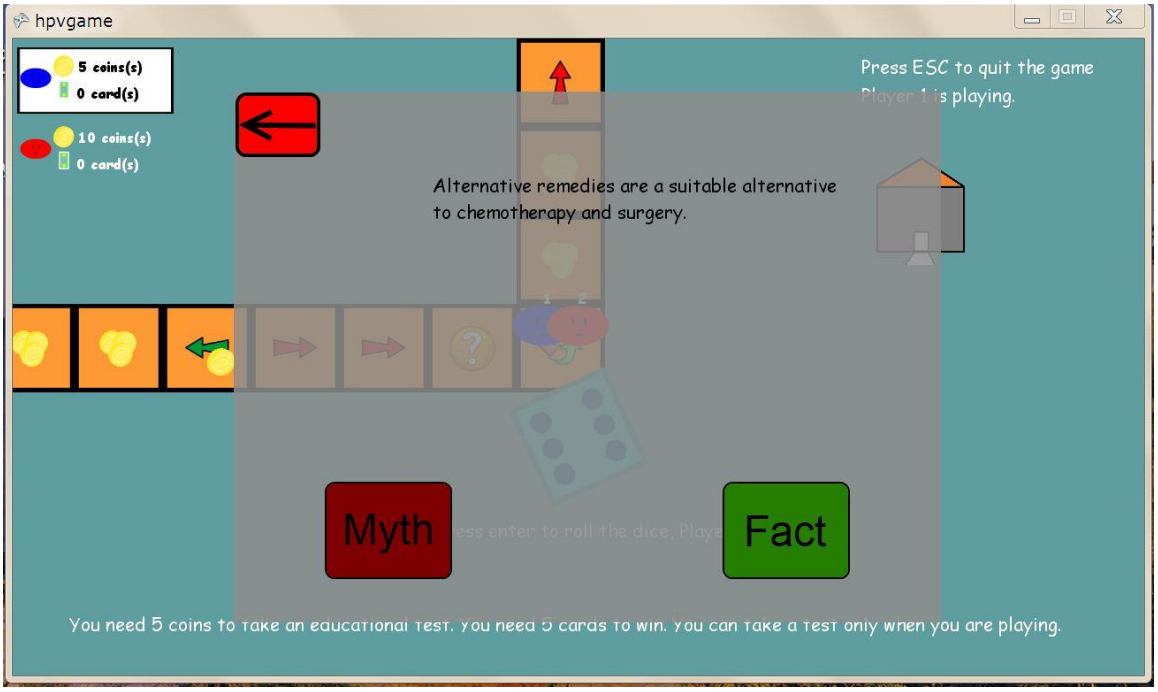

Figure 4.14: The Fact/Myth Test of the game, in English

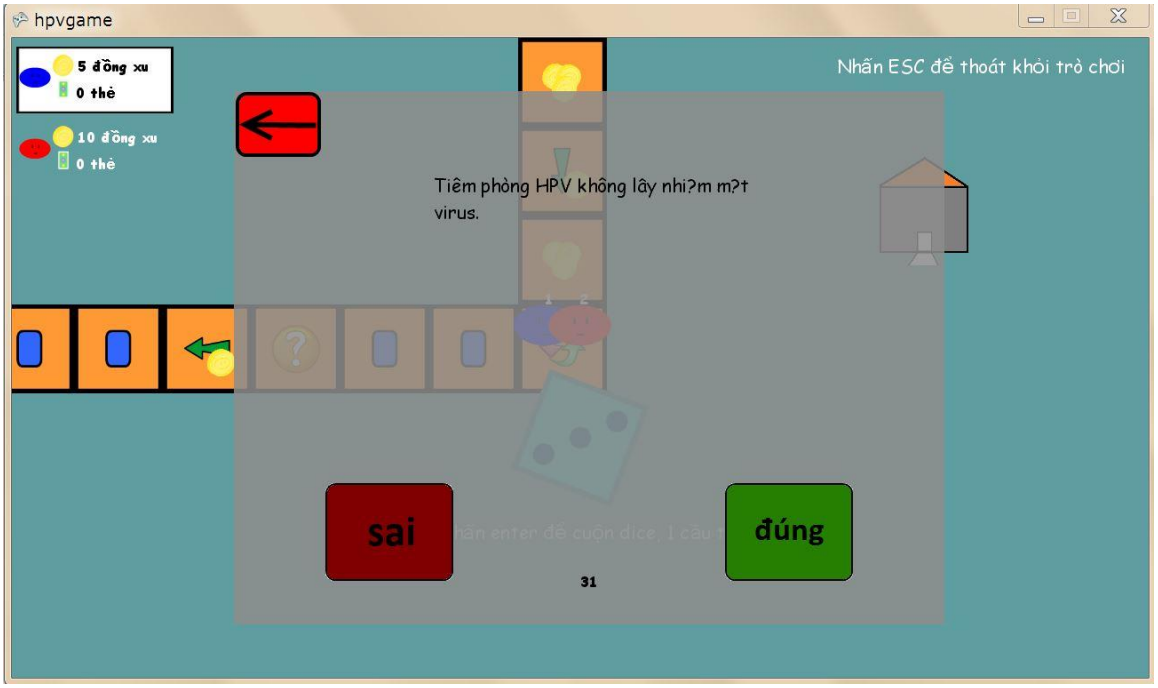

Figure 4.15: The Fact/Myth Test of the game, in Vietnamese

Figure 4.16: The Fact/Myth Test of the game, in Korean

After the player runs out of coins to take a test, rolling the dice to gain more coins and/or cards is the only way they can progress in the game during their turn, and it is subsequent events that occur during gameplay by landing on individual tiles between taking educational tests and getting Fact/Myth Cards that make up the rest of the game. Some tiles landed on simply consist of three coins awarded to the player, while others give a random event, such as causing the player to suddenly lose or win either a few coins, or (more rarely) a Fact/Myth card, which potentially give them a siginificent advantage or major setback before winning the game. Other tiles have "minigame" events, in which the player is shown an unknown playing card and must make the correct choice depending on the type of minigame (red or black, face or number, odd or even, and higher or lower compared to another card). If the player's guess about the unknown

card is correct, they are awarded five coins, instantly rewarding them with the ability to take a test in here next turn. Finally, there are two tiles that allow the player to roll the dice again and move – green arrow to move forward and red arrow to move backward. If the player lands on a tile that allows them to move forward, they will also get a free coin. The non-test taking portion of the game is shown below in Figures 4.11, 4.12, and 4.13. One minigame is shown in all languages in Figures 4.17, 4.18, and 4.19.

If the user forgets the rules of the game, i.e. how to make progress in and win the game or did not view the help menu in the beginning, the game play screen (Fig. 4.11) will still show essential information regarding what is necessary to continue at the bottom of the screen. We placed the guiding comments on the main play screen in English to make the game truly user-friendly.

All of the type of tiles mentioned above either directly influence the players' resources, some of which depend on their luck, or move their avatars to places where their resources will be influenced, both of which help in experiencing the true look and feel of a game where the players actively engage against the opponents and/or the systems they are interacting with. Because the arrangement of tiles on the board are randomized at the beginning of each game session, the game experience is made unique each time it is played. All of these features are intended to augment the educational experiences and give each player a reason to move forward from question to question without being bored or overwhelmed with trivia about HPV and cervical cancer.

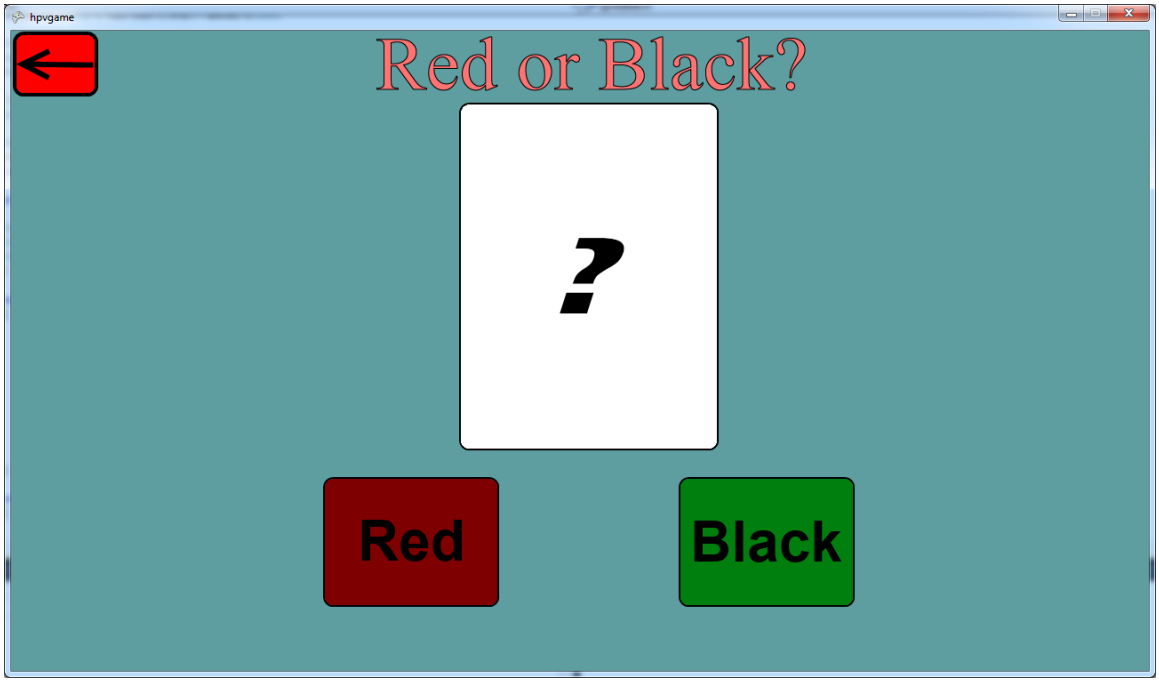

Figure 4.17 Minigame screen in English

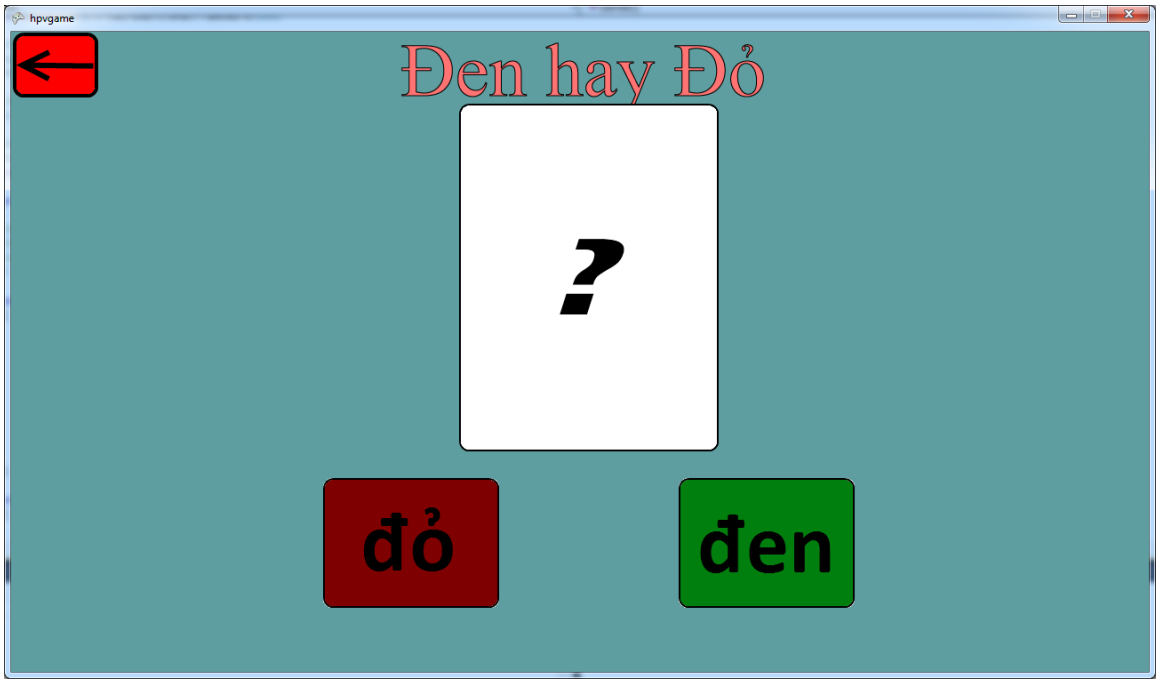

Figure 4.18 Minigame screen in Vietnamese

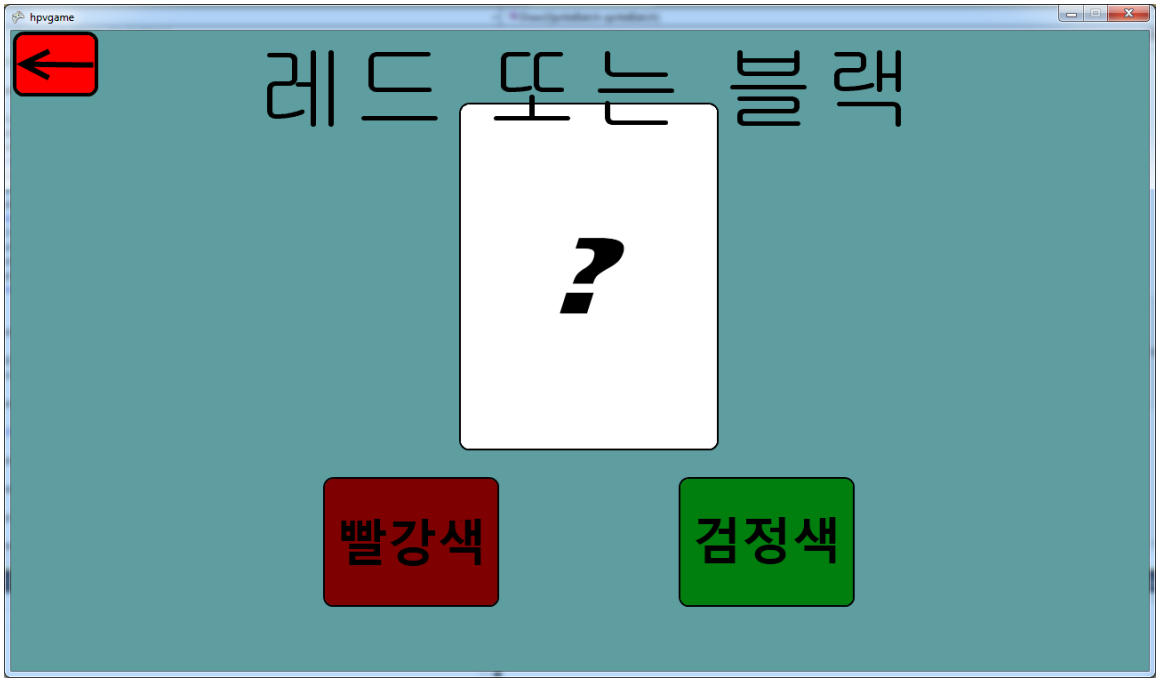

Figure 4.19 Minigame screen in Korean

To make the game more user friendly, we only show the button “Click to take test” when the player possesses enough coins to take the test and when it is his turn to play and also when he has not yet made any moves during the current turn. This way the player is always aware about when he can take the test. Even when he sees the message asking him to take the educational test, he may choose to ignore it and just press Enter to roll the dice.

4.2 Game Development

Because we were developing a video game rather than a physical board game, we also had to make important decisions about the software that would drive the experience.

4.2.1 Choosing the Computing Platform

Because we wanted to make a game that would reach as many people as possible, we also wanted it to run on as many personal computers as possible. Due to time constraints, we were willing to choose a development toolset that would forgo support for multiple operating systems in favor of quick and easy support for a popular one. We chose Microsoft Windows as the ideal operating system for the game to run on, since many programming libraries support it.

4.2.2 Choosing the Library and Programming Language

In order to develop a game with all of the features that were outlined above in a timely manner, we used version 4.0 of the Microsoft XNA Framework, which allows us to create games targeting their recent Windows platforms, allowing us to reach a large potential audience given the platform's ubiquity in home personal computers. We chose to use this framework because it is simple enough to rapidly program, debug and test prototypes of games in the high-level C# language thanks to its rich features, while also having enough of its own functions that we do not have to worry about the low-level vagaries of game engine development, such as image loading and blitting, font rendering, user input and audio playback. Despite the functionality that is already built into XNA, the framework is also flexible enough not to impose any arbitrary restrictions that would constrain our design.

To be able to add and make changes to test questions easily in the game, we used XNA's font rendering capability to draw text on the screen. Because Unicode characters are also supported, we were also able to easily add Vietnamese and Korean support without having to resort to tedious loading of images and text and wasting disk space. Language selection is done in a separate menu of the game, shown in Figure 4.7

5 Designing and Conducting the Survey

5.1 Designing Survey Questions

Once the game was finally developed to the point of being fully playable in all three languages, we designed a one page form that has questions for players to answer after playing the game. This form given to women who played the game is shown in Figure 5.1. This form shows that we wanted to know if a player had fun playing the game, and if he or she learnt a little or a lot about HPV and cervical cancer from playing the game. We also wanted to know if the player considered this better at educating the player about HPV and cervical cancer compared to traditional methods. We also wanted to know how the player considered the translation of the game in Korean or Vietnamese, if applicable. We analyzed these data to observe any correlations between these factors and players' perception toward our education game.

Please honestly fill this form after playing the game and hand it over to us.

Name:

Address:

Phone Number:

Email Address:

1. **How often do you play video games? ___**
(0 = Never, 1= 1 hour a week, 2= 2 hours, 3= 3 hours, 4= 4 hours, n= n hours weekly)

2. **How old are you? ___**

3. How easy was it to install the game and run?
1= very easy, 2 = somewhat easy, 3= not easy

4. **Do you consider yourself more educated about HPV after playing the game?**
1= not educated, 2= somewhat educated, 3 = very much educated

5. **Do you consider whether the game does a better job of educating the user, compared to reading pamphlets and on the Internet?**
1= yes, 2 = NO

6. **Did you have an entertaining experience in playing the game?**
1= NO, 2 = yes, had some fun , 3= had lots of fun

7. **How easy was the game to understand and play?**
1= easy , 2= not easy

8. **If you did not play the game in English, how was quality of the translation?**
1 = good, 2= not good , 3= N/A

9. **What (if anything) do you consider missing in the game?**

10. **Do you have any suggestions to improve the game?**

Figure 5.1 The form given to participants

5.2 Conducting the Survey

Our goal was to get feedback from women of various ages in each of the three linguistic groups – English, Vietnamese and Korean. When we embarked on this task, we recruited the participants using convenience recruitment methods. The first lady to download the game from the internet, install it and play was a family friend. This lady, who is young, educated, and familiar with computers and software, needed some help in playing the game, as all the critical instructions were still not present on the main page. She played the game and sent us valuable feedback for improving the game. We evaluated her suggestions and then improved the game by implementing her valuable suggestions.

Next we started approaching the ladies from the household of our family friends and relatives. We would send them email message and follow it with a phone call. If we received no response within a week, we would follow up with another phone call. We found that younger women were more likely to download the game, install it and play it on their own. The women who were older or who were immigrants were more likely to need our help in installing and playing the game. This was true for all three linguistic groups. As they played the game and gave us their feedback via email or on the phone, as they found convenient, we continued to improve the game.

Our aim was to make the game progressively easier to install, and fun to play and learn as we continued with the survey.

Having almost finished with the English speaking participants, we focused our attention to the Vietnamese community. We searched Google for Vietnamese restaurants

in Houston and visited them. At the restaurants, we would first talk to the manager and get permission to approach their waitresses and the customers. When we approached the customers, we found that all of them were busy eating and had no time to play our game. The waitresses did play the game and did give us their feedback. Sometimes the owners too played the game. We had more luck at restaurants that were not busy.

So, the next day we visited the restaurants at a time when customers were not likely to be present. From our neighbor, we found out a Buddhist temple near our home that was mainly visited by the Vietnamese community. So we visited the temple and got some people to play the game and give us feedback. From them we found out the best time on the week-end when a large crowd of people would be present.

The following weekend we visited the temple at that time and were able to get many women to play the game. From them we also found a Catholic church that had mainly Vietnamese members. So the next weekend we visited that church on a Sunday and were able to get many more women to play the game.

Next we turned our attention to the Korean community. At the Vietnamese church, someone had told us that a certain neighborhood in southwest Houston was a center of Korean community and had many Korean restaurants. We visited that neighborhood and found that indeed there were many Korean restaurants, shops, and businesses. We would walk into a business and ask the manager if they or one of their employees would be able to play our game in Korean. About half of the businesses we approached agreed to play while the other half said that they were too busy or were not interested. Here again we found that a lady who owned or worked at a business or restaurant would be more willing

to play the game if she had no customers. This way we continued to get more and more people to play our game and give us feedback.

As we made progress, we continued to improve the game based on user feedback. For example, one user said that the Korean translation of the word for "False" was not correct. So, we corrected the translation using Google Translate and confirmed from a Korean player that the new translation was now correct. But we still did not have as many Korean feedbacks as we wanted.

One day, while driving we saw a Baptist church that had “Korean” in church name. So we went inside and from the information written on the door, we found out their prayer time on Sundays and went there at that time on a Sunday. To our delight, we found that the hall was full of Korean and other Asian people, mostly young, who were eating lunch and socializing. We started to approach some women and found that due to the relaxed environment, they were very willing to play our game and give us feedback. This way we got feedbacks from around 37 Korean women.

6 Survey Results and Data Analysis

6.1 Results from All Participants

The final data we received from all 111 women can be summarized as follows:

Answers to question: **How often do you play games?**

Answer	Count	Percent
Never	53	47.75%
1 hour a week	31	27.93%
2 hours a week	20	18.02%
3 hours a week	3	2.70%
>3 hours a week	4	3.60%
The following relates to number of hours of video games played each week		
Mean of hours played	0.9	
Median of hours played	1	
Mode of hours played	0	
Standard Deviation	1.21	

Table 6.1: Number of hours a week all participants play video games

Answers to question: **What is your age?**

Answer	Count	Percent
Ages 10-19	11	9.91%
Ages 20-29	30	27.03%
Ages 30-39	26	23.42%
Ages 40-49	25	22.52%
Ages >=50	19	17.12%
The following relates to the age of participants		
Mean Age:	35.9	
Median Age	35	
Mode Age	42	
Standard Deviation	13.6	

Table 6.2: Ages of all participants

Answers to question: **How much educated do you feel about HPV and cervical cancer after playing the game?**

Answer	Count	Percent
Not educated at all	4	3.60%
Somewhat educated	34	30.63%
Very much educated	73	65.77%

Table 6.3: Measure of education of all participants after a play session

Answers to question: **Do you believe that this game is more effective at teaching than pamphlets or the Internet?**

Answer	Count	Percent
Yes	95	85.59%
No	16	14.41%

Table 6.4: Measure of efficacy of this educational game from all participants

Answers to question: **Did you have fun playing the game?**

Answers	Count	Percent
No	7	6.31%
Had some fun	71	63.96%
Had lots of fun	33	29.73%

Table 6.5: Measure of the fun all users had

Answers to question: **Was the game easy to understand and play?**

Answers	Count	Percent
Easy	104	93.69%
Not easy	7	6.31%

Table 6.6: Measure of how easy the game was to play for all participants

Answers to question: **How was the quality of the translation?**

Answers	Count	Percent
Good	72	97.3 %
Not Good	2	2.7 %

Table 6.7: Measure of translation quality of game from non-English participants

6.2 Analysis of Data from All Participants

Without taking ethnic background and age into question, it appears that our game was largely successful in educating women about HPV and cervical cancer and equally entertaining them at the same time, and was simple to understand and play. It should also be noted that while a noticeable minority of women learned only a little or had only some fun with the game, nearly all participants agreed that a game was a viable if not superior alternative to traditional means of learning about the topic. Most of these women admitted that while they themselves did not play games much if at all, they knew that younger women or future generations would very likely accept the medium more than they did, mentioning how they knew that games were becoming more popular, or how their younger relatives and friends were more interested in games.

6.3 Results from English Participants

These are the result from the English group:

Answers to question: **How often do you play games?**

Answer	**Count**	**Percent**
Never	17	45.95%
1 hour a week	11	29.73%
2 hours a week	8	21.62%
3 hours a week	1	2.70%
>3 hours a week	0	0.00%
The following relates to number of hours weekly that players play video games		
Mean of hours played	0.81	
Median of hours played	1	
Mode of hours played	0	
Standard Deviation	0.88	

Table 6.8: How many hours a week English participants play games

Answers to question: **What is your age?**

Answer	Count	Percent
Ages 10-19	7	18.92%
Ages 20-29	9	24.32%
Ages 30-39	5	13.51%
Ages 40-49	8	21.62%
Ages >=50	8	21.62%
The following relates to age of participants		
Mean Age:	35.9	
Median Age	35	
Mode Age	22	
Standard Deviation	16.6	

Table 6.9: Age of English participants

Answers to question: **How much educated are you about HPV and Cervical Cancer after playing the game?**

Answer	Count	Percent
Not educated at all	2	5.41%
Somewhat educated	4	10.81%
Very much educated	31	83.78%

Table 6.10: Measure of education of English participants after a play session

Answers to question: **Do you believe that this game is more effective at teaching than pamphlets or the Internet?**

Answer	Count	Percent
Yes	34	91.89%
No	3	8.11%

Table 6.11: Measure of efficacy of educational games from English participants

Answers to question: **Did you have fun playing the game?**

Answers	Count	Percent
No	1	2.70%
Had some fun	17	45.95%
Had lots of fun	19	51.35%

Table 6.12: Measure of the fun English participants had

Answers to question: **How easy was the game to understand and play?**

Answers	Count	Percent
Easy	33	89.19%
Not easy	4	10.81%

Table 6.13: Measure of how easy the game was to play for English participants

6.4 Analysis of Data from English Participants

The data shows that close to 90 percent of participants answered that the game was easy to play. Also 96 percent of players learnt a little or a lot about the subject matter from playing the game. Close to 92 percent answered that the game was a superior tool for teaching the subject matter compared to traditional methods.

6.5 Results from Vietnamese Participants

Our analysis of Vietnamese participants is as follows:

Answers to question: **How often have you played games?**

Answer	Count	Percent
Never	10	27.03%
1 hour a week	13	35.14%
2 hours a week	9	24.32%
3 hours a week	1	2.70%
>3 hours a week	4	10.81%
The following relates to number of hours players play video games each week		
Mean of hours played	1.46	

Median of hours played	1	
Mode of hours played	1	
Standard Deviation	1.59	

Table 6.14: How many hours a week Vietnamese participants play games

Answers to question: **What is your age?**

Answer	**Count**	**Percent**
Ages 10-19	2	5.41%
Ages 20-29	14	37.84%
Ages 30-39	10	27.03%
Ages 40-49	6	16.22%
Ages >=50	5	13.51%
The following relates to age of participants		
Mean Age	34.4	
Median Age	33	
Mode Age	20	
Standard Deviation	12.7	

Table 6.15: Age of Vietnamese participants

Answers to question: **How much educated are you about HPV and Cervical Cancer after playing the game?**

Answer	**Count**	**Percent**
Not educated at all	0	0.00%
Somewhat educated	8	21.62%
Very much educated	29	78.38%

Table 6.16: Measure of education of Vietnamese participants after a play session

Answers to question: **Do you believe that this game is more effective at teaching than pamphlets or the Internet?**

Answer	**Count**	**Percent**
Yes	36	97.30%
No	1	2.70%

Table 6.17: Measure of efficacy of educational games from Vietnamese participants

Answers to question: **Did you have fun playing the game?**

Answers	Count	Percent
No	0	0.00%
Had some fun	35	94.59%
Had lots of fun	2	5.41%

Table 6.18: Measure of the fun Vietnamese participants had

Answers to question: **How easy was the game to understand and play?**

Answers	Count	Percent
Easy	36	97.30%
Not easy	1	2.70%

Table 6.19: Measure of how easy the game was to play for Vietnamese participants

Answers to question: **What was the quality of the translation?**

Answers	Count	Percent
Good	36	97.30%
Not Good	1	2.70%

Table 6.20: Measure of translation quality from Vietnamese participants

6.6 Analysis of Data from Vietnamese Participants

The data shows that close to 97 percent of participants answered that the game was easy to play. Also 100 percent of players learnt a little or a lot about the subject matter from playing the game. Close to 97 percent of players answered that the game was a superior tool for teaching the subject matter compared to traditional methods.

6.7 Results from Korean Participants

Finally, the data from Korean participants is as follows:

Answers to question: **How often do you play games?**

Answer	**Count**	**Percent**
Never	26	70.27%
1 hour a week	7	18.92%
2 hours a week	3	8.11%
3 hours a week	1	2.70%
>3 hours a week	0	0.00%
The following relates to number of hours that players play video games weekly		
Mean of hours	0.43	
Median of hours	0	
Mode of hours	0	
Standard Deviation	0.77	

Table 6.21: How many hours a week Korean participants play games

Answers to question: **What is your age?**

Answer	**Count**	**Percent**
Ages 10-19	2	5.41%
Ages 20-29	7	18.92%
Ages 30-39	11	29.73%
Ages 40-49	11	29.73%
Ages >=50	6	16.22%
The following relates to age of participants		
Mean Age:	37.4	
Median Age	36	
Mode Age	42	
Standard Deviation	11.3	

Table 6.22: Age of Korean participants

Answers to question: **How much educated are you about HPV and Cervical Cancer after playing the game**?

Answer	**Count**	**Percent**
Not educated at all	2	5.41%
Somewhat educated	22	59.46%
Very much educated	13	35.14%

Table 6.23: Measure of education of Korean participants after a play session

Answers to question: **Is this game more effective as educational tool than pamphlets and reading on the Web?**

Answer	Count	Percent
Yes	25	67.57%
No	12	32.43%

Table 6.24: Measure of efficacy of educational games from Korean participants

Answers to question: **Did you have fun playing the game?**

Answers	Count	Percent
No	6	16.22%
Had some fun	19	51.35%
Had lots of fun	12	32.43%

Table 6.25: Measure of the fun Korean participants had

Answers to question: **How easy was the game to understand and play?**

Answers	Count	Percent
Easy	35	94.59%
Not easy	2	5.41%

Table 6.26: Measure of how easy the game was to play for Korean participants

Answers to question: **What was the quality of the translation?**

Answers	Count	Percent
Good	36	97.30%
Not Good	1	2.70%
Not Applicable	0	0.00%

Table 6.27: Measure of translation quality from Korean participants

6.8 Analysis of Data from Korean Participants

About 95 percent of players answered that they got some or a lot of education from paying the game. The same percent answered that the game was easy to understand and play. Also 84 percent of players had some fun playing the game. However, only 68 percent of players thought that this game was superior to traditional method of teaching about HPV and cervical cancer.

We noticed a startling difference between the acceptance of the game between Korean and other participants. Using analysis of variance (ANOVA), we found that $p < 0.05$ and $F = 5.812$ when measuring the difference of means of the game's fun factor between Korean and English participants, while $p < 0.05$ and $F = 34.105$ when measuring the difference of means of the game's education factor between Korean and Vietnamese participants. We also found that $p < 0.001$ and $F = 15.231$ when measuring the difference of means of the games usability factor (how it compared to traditional means) between Korean and Vietnamese participants. This data indicates that difference in acceptance of the game between the Korean audience and others is not accidental – however, we are struggling to explain why this difference exists.

7 Implications

The survey of participants that we conducted has revealed that the genre of e-game can be successfully used to disseminate information not only about a medical topic but about any topic of public interest. In fact while conducting our survey, one Korean lady in

Houston, who obviously was very religious and who played our game, suggested that we write another game to teach people about the Bible.

8 Conclusion

We conclude that an educational game was more effective than traditional methods of teaching about an important topic, though this can depend on differences of language and culture. Our survey has revealed that English speaking American women found it much easier to install this game and play it, compared to immigrants who played in Korean or Vietnamese. On the whole, around 31 percent of players answered that they got somewhat educated about HPV and cervical cancer, while around 66 percent answered that they got very much educated.

Around 95 percent answered that this game does a better job of educating women about HPV and cervical cancer compared to traditional non-interactive methods like pamphlets and web sites. Around 94 percent had some or a lot of fun playing this game. So a serious educational board game that is entertaining and is designed around a central theme of educating about a topic and that succeeds in immersing the players by captivating their mind has a very bright future.

9 Future Work

There is plenty of work to be done not only in the field of HPV and cervical cancer education, but also in the field of serious game development. As some participants noted, this game would have benefitted from an overhaul of its graphics and audio in order to

increase the polish and immersion factor, which would have enticed people to play the game and learn in the process.

In order to obtain more data from a greater variety of people, additional languages should be implemented in the game, which would allow for a better study of the different attitudes towards digital games among various cultures and ethnicities as well as their responses to education about HPV and cervical cancer.

While making a digital board game was easier on our part of development, it remains to be seen if the genre is optimal for teaching about such a topic. We would like to see if experimentation into other styles of games such as visual novels can also yield interesting results in ways of teaching different audiences, especially to those who do not get entertainment through purely ludic experiences such as from board games.

Even within the confines of board games, there is still room for trying new ideas that affect how players have fun and learn. These ideas can range from small tweaks to the design, such as increasing the number of cards necessary to win the game, thereby requiring players to get more questions about the topic right to win, to more impactful choices such as forcing the player to end their turn when answering a question, or allowing a greater variety of the types of questions asked, such as multiple choice questions.

Some participants suggested even bigger changes, such as letting players learn all of the facts about HPV and cervical cancer after the game has ended, so that everyone learns the same amount of information rather than limiting learning to the players who dedicate the most time to the game. Because not every player has the same skill level or

expectations of an educational game, such tweaks or modifications can be made optional to accommodate as many people as possible without compromising the educational factor.

Appendix A: Educational test questions and explanations in English

Seq. Num.	Statement	Myth (M) Or Fact (F)	Explanation
1	I do not need a test to find cervical cancer. I will know if I have HPV.	M	HPV infection is very common in women. Most HPV infections are called "High Risk" because cervical cells that are infected can grow abnormally and years later turn into cancer.
2	Cervical cancer is fatal so it is better for me if I do not know that I have cancer.	M	When detected early cervical cancer can be successfully treated.
3	You can prevent cancer of the cervix.	F	Cancer of the cervix can be treated.
4	Asking about HPV vaccine will indicate that one is sexually active.	M	Asking about the HPV vaccine means that one wants more information to prevent HPV.
5	The HPV vaccine will not negatively impact a woman's future fertility.	F	There is no evidence that suggests that the HPV vaccine impacts fertility.
6	HPV and HIV are not similar and prevention strategies are not the same.	F	HPV and HIV are distinctly different and prevention approaches also differ.
7	If a person is loyal in a relationship and has only one intimate partner, she still needs the HPV vaccine and is at risk for cervical cancer.	F	Since HPV is very common, having one partner does not ensure protection against cervical cancer.
8	If I allow my son to marry a woman who has cervical cancer their children will not be born with cancer.	F	Women who have cervical cancer do not pass it on to their children.
9	My daughter is too young, and has not had sexual relationship, so she is not at risk now. She does not need to get the HPV vaccine.	M	The HPV vaccine is most effective when given to teenagers before they begin to have sex.
10	If I am single I will not get HPV.	M	HPV is spread through sexual contact, but the virus is very common and can be spread by contact with the infected skin without having sex.
11	HPV can be spread through oral sex.	F	HPV can be transmitted by oral sex.
12	HPV can be transmitted through bodily fluids (blood and semen) and use of condoms can successfully prevent transmission of HPV.	M	Since HPV is not transmitted through body fluids, use of condoms does not fully protect one from contracting HPV.
13	Few people who are sexually active will contract HPV.	M	At least 50% of those who are sexually active will contract HPV.
14	Cervical cancer has no symptoms.	M	Bleeding after intercourse, bleeding between menstrual periods or bleeding after menopause may indicate cervical cancer. Other symptoms include an abnormal discharge or pain in the pelvic region.

15	Only older women get cervical cancer.	M	While cervical cancer risk increases with age, women should get Pap tests starting at age 21.
16	Smoking increases risk of cervical cancer.	F	Smoking increases risk of cervical cancer along with other factors.
17	Cervical cancer treatment requires me to put my life on hold.	M	While treatment is disruptive, most patients can lead productive lives, such as in work or school.
18	Alternative remedies are a suitable alternative to chemotherapy and surgery.	M	Traditional treatment such as chemotherapy and surgery offer the best chance to combat cancer.
19	Once a woman is infected with the HPV virus, she is infected for life.	M	The majority of young women who contract the human papillomavirus (HPV) will clear the initial infection within 6 months.
20	Cervical cancer is not contagious.	F	While HPV can be transmitted through sexual contact, cancerous cells cannot be spread person to person.
21	A normal Pap test means that a woman is cancer-free.	M	The Pap test only screens for cervical cancer or precancerous cells of the cervix. There are no screening tests for uterine or ovarian cancers.
22	The Pap test is the best way to screen a woman for sexually transmitted diseases (STDs).	M	The Pap test only screens for cervical cancer or precancerous cells of the cervix. Other STDs require separate tests.
23	If an operation is performed to remove the cancer, the moment the body is opened up, the cancer will spread everywhere.	M	Exposure of tumors to air during surgery does not cause them to spread.
24	Women younger than age 50 do not need hormone replacement therapy when undergoing surgery.	F	The majority of cervical cancers that can be treated with a hysterectomy do not require that the ovaries be removed.
25	Radiation treatments will not cause my hair to fall out.	F	When radiation is used to treat cervical cancer, patients do not lose their hair.
26	Chemotherapy makes patients deathly ill.	M	Patients are able to tolerate most chemotherapy drugs, and several are tolerated very well.
27	If I get the cervical cancer vaccine, I won't have to have Pap smears anymore.	M	The vaccine does not eliminate the need for regular screening for cervical cancer, including the performance of routine Pap smears.
28	Vitamins and health supplements are dangerous to take while receiving chemotherapy.	M	Most vitamins are safe to take during treatment with chemotherapy.
29	If my partner tested negative for sexually transmitted infections, my partner doesn't have HPV.	M	Providers may not test for HPV, even in women, unless an abnormal result on a Pap test occurs.
30	HPV is mainly a problem among homosexuals.	M	Anyone who has sexual contact with another person can get the HPV infection.
31	HPV also affects men.	F	Both men and women can contract HPV, genital warts, and get cancer (though only women get cervical cancer.

32	I can tell if my partner has HPV.	M	You can't physically see whether a person has an HPV infection unless the person has genital warts.
33	HPV vaccination does not infect one with the virus.	F	These vaccines do not contain any live or dead virus and cannot infect you with HPV.
34	Not all types of HPV will lead to cancer.	F	Only some of the 150 strains of HPV cause cancer, while others cause warts.
35	HPV stands for Human Purity Virus	M	HPV stands for Human Papillomavirus.
36	HPV can only be transmitted via sexual contact	M	HPV can also be transmitted if one touches a towel or another object used by someone who has the virus.
37	There is only one type of HPV	M	There are more than 100 types of HPV
38	Anyone who comes into contact with the skin of a HPV infected person will get HPV	M	Everyone's immune system is different, so not everyone who comes into contact with HPV will develop HPV.
39	Only women get HPV	M	Both men and women get HPV. The human papillomavirus (HPV) which is often sexually transmitted is responsible for a rapidly growing type of oral cancer, and now new research may help explain why men get the cancer more than women.
40	If you get HPV you will get symptoms	M	The immune system of 90 percent of people who get HPV will clear it within two years.
41	HPV always causes cervical cancer	M	HPV of genital area causes cervical cancer. But other cancers that can be caused by HPV include cancers of the vulva, vagina, penis, anus, and oropharynx (back of throat including base of tongue and tonsils).
42	HPV always causes warts	M	Warts are one symptom of HPV but other symptoms may not appear until they are much advanced like Cervical Cancer, and cancers of the vulva, vagina, penis, anus, and oropharynx (back of throat including base of tongue and tonsils).
43	Warts are caused by HPV	F	Different HPV (human papillomavirus) strains cause warts. The wart-causing virus can be passed on by close skin-to-skin contact, as well as through contact with towels or shoes.
44	Warts always become cancers	M	Some warts are not genital like those on fingers. Even genital warts caused by HPV do not turn into cancers. The types of HPV that can cause genital warts are not the same as the types that can cause cancers.
45	If you get HPV, the symptoms will show quickly.	M	Most people who become infected with HPV do not even know they have it. Most people with HPV do not develop symptoms or health problems from it. A person can have HPV even if years have passed since he or she had sexual contact with an infected person. Most infected persons do

			not realize they are infected or that they are passing the virus on to a sex partner.
46	The sure way to avoid HPV is to avoid sex with a partner who may have multiple sex partners.	F	HPV is passed on through genital contact, most often during vaginal and anal sex. Hence the sure way to avoid HPV is to avoid sex with a partner who may have multiple sex partners
47	Genital warts do not become cancers.	F	If left untreated, genital warts might go away, remain unchanged, or increase in size or number. They will not turn into cancer.
48	The best time to get HPV vaccine is around twelve years of age.	F	Vaccines can protect males and females against some of the most common types of HPV that can lead to disease and cancer. These vaccines are given in three shots. It is important to get all three doses to get the best protection. The vaccines are most effective when given at 11 or 12 years of age.
49	Condoms can help avoid HPV.	F	For those who choose to be sexually active, condoms may lower the risk of HPV. To be most effective, they should be used with every sex act, from start to finish. Condoms may also lower the risk of developing HPV-related diseases, such as genital warts and cervical cancer. But HPV can infect areas that are not covered by a condom - so condoms may not *fully* protect against HPV.
50	There are two vaccines (Cervarix and Gardasil) that can protect women against most cervical cancers.	F	These vaccines do exist and serve this purpose.
51	A vaccine (Gardasil) is available to protect against most genital warts in males and females.	F	Gardasil is available for this purpose.
52	A vaccine (Gardasil) is available to protect against most anal cancers in males and females.	F	Gardasil is available for this purpose.
53	There is no treatment to eliminate HPV.	F	There is no treatment for the virus itself, but there *are* treatments for the diseases that HPV can cause.
54	Cervical Cancer is the easiest cancer to prevent.	F	Cervical cancer is the easiest female cancer to prevent, with regular screening tests and follow-up. The two tests are Pap test and HPV test.
55	HPV test can detect HPV.	F	The HPV test looks for the virus (human papillomavirus) that can cause cell changes.
56	Pap test needs hospital admission.	M	The Pap test is recommended for all women between the ages of 21 and 65 years old, and can be done in a doctor's office or clinic.
57	One should get regular screening via Pap	F	The Pap test, which screens for cervical

	test starting at 21 years of age.		cancer, is one of the most reliable and effective cancer screening tests available.
58	Cervical cancer means death.	M	Cervical cancer, if detected early can be treated and cured.

Appendix B: Educational test questions and explanations in Korean

Seq. Num.	Statement	Myth (M) Or Fact (F)	Explanation
1	나는 자궁경부암에 걸렸는지 스스로 알수 있으므로 자궁경부암 검사를 받을 필요가 없습니다.	M	HPV감염은 여성들사이에서 매우 보편적으로 일어납니다. 대다수의 HPV감염은 자궁경부의 세포를 기형적으로 자라게 만들고 수년후에 암으로 전이 시키므로 “고위험성”이라고 불립니다.
2	자궁경부암은 치명적이므로 암의 유무여부를 모르는것이 낫습니다.	M	자궁경부암은 조기발견시 성공적으로 치료될수 있습니다.
3	당신은 자궁경부암을 예방할수 있습니다.	F	자궁경부암은 치료가능합니다.
4	HPV백신에 대한 문의는 문의자가 현재 성생활이 활발함을 의미합니다.	M	HPV백신에 대한 문의는 문의자가 HPV예방에 대한 정보를 원함을 의미합니다.
5	HPV백신은 여성의 임신 또는 출산에 부정적인 영향을 끼치지 않습니다.	F	HPV백신이 임신및 출산에 영향을 미친다는 증거는 없습니다.
6	HPV와 HIV는 동일하지 않으므로 예방법도 같지 않습니다.	F	HPV와 HIV는 확연히 다르며 마찬가지로 예방법또한 다릅니다.
7	여성의 파트너가 충실하며 오직 당사자와만 관계를 갖는다 하더라도 여성은 자궁경부암에 노출될수 있으므로 HPV 백신이 필요합니다.	F	HPV는 매우 보편적이므로 한 파트너와만의 관계가 여성을 자궁경부암으로부터 보호한다고는 확신할수 없습니다.
8	내 아들이 자궁경부암을 가진 여성과 결혼한다고 해서 그들의 자식들이 암을 물려받지는 않습니다.	F	자궁경부암에 걸린 여성이라해서 암을 자식들에세 물려주지는 않습니다.
9	내 딸은 너무 어리고 성관계 전임으로 아직은 위험에 노출돼있지 않습니다. 그러므로 HPV 백신이 필요 없습니다.	M	HPV백신은 성관계이전의 청소년시기에 투여할 때에 가장 효과적입니다.
10	나는 독신이므로 HPV에 걸리지 않습니다.	M	HPV는 성접촉시 감염되지만매우 보편적이므로 성관계없이도 감염된 피부접촉만으로도 감염될수 있습니다.
11	HPV는 구강성교로도 감염될수 있습니다.	F	HPV는 구강성교를 통해서도 감염될수 있습니다.
12	HPV는 체액 (피 또는 정액)을 통해 감염되므로 콘돔을 사용하면 HPV감염을 막을수 있습니다.	M	HPV는 체액을 통해 감염되므로 콘돔이HPV감염으로부터 완벽하게 보호하지는 못합니다.
13	성활동이 활발한 사람들 중에서도 소수만이 HPV에 감염됩니다.	M	성생활이 활발한 인구중 최소한 50%는 HPV에 감염될 확률이 큽니다.

14	자궁경부암은 걸려도 증상이 없습니다.	M	성관계후의 출혈, 월경(생리)중의 출혈, 또는\n폐경기후의 출혈은 자궁경부암에 걸렸음을\n나타낼수 있습니다. 또다른 증상으로는 불규칙적인\n분비물 또는 골반부위의 고통등이 있습니다.
15	나이가 많은 여성들만 자궁경부암에 걸립니다.	M	자궁경부암에 걸릴 위험이 나이가 많아질수록 높아지지만 여성은 21세 이후부터 팹 테스트 (자궁경부암 조기 검사법의 하나)를 받아야 합니다.
16	흡연은 자궁경부암에 걸릴 확률을 높힙니다.	F	흡연과 및 여러 요소들이 자궁경부암에 걸릴 확률을 높힙니다.
17	자궁경부암치료를 위해서는 현재 진행중인 모든 일들을 중단해야 합니다.	M	치료가 생활에 지장을 주지만 대다수의 환자들은 일자리나 학교등에서 생산적인 활동을 합니다.
18	대체의학 치료가 화학요법이나 수술을 대체할수 있습니다.	M	화학요법이나 수술등의 전통적인 치료요법이 암과 싸우는데 있어서 가장 효과적입니다.
19	여성이 HPV 바이러스에 한번 감염되면, 그 여성은 평생 바이러스를 보균하게 됩니다.	M	대다수의 젊은 여성들은 HPV바이러스에 접촉후 6개월안에 바이러스로부터 해방됩니다.
20	자궁경부암은 감염되지 않습니다.	F	HPV는 성접촉시 감염되지만 암세포는 사람들사이로 전염되지는 않습니다.
21	정상적인 자궁 얼룩은 여성이 암으로부터 안전을 나타냅니다.	M	자궁 검사 자궁 경부암에 대한 화면 만. 자궁이나 난소 암에 대한 검사 테스트는 없습니다.
22	자궁 검사는 성병 (성병) 에 대한 여자를 화면에 가장 좋은 방법입니다.	M	자궁 검사는 자궁 경부의 자궁 경부 암 세포에 대한 화면. 다른 성병은 별도의 테스트가 필요합니다.
23	작업이 암세포를 제거하기 위해 수행되고 몸 열어 경우, 암 사방에 퍼져 것입니다.	M	종양의 수술 하는 동안 공기에 노출 확산 그들을 발생 하지 않습니다.
24	수술을받은 경우 50 세 이하의 여성은 호르몬 대체 요법이 필요하지 않습니다.	F	대부분의 자궁 경부 암 치료는 난소의 제거를 요구하지 않습니다.
25	방사선 치료는 내 머리가 빠지는 원인이되지 않습니다.	F	방사선은 자궁 경부 암을 치료하는 데 사용되는 경우, 환자는 탈모가되지 않습니다.
26	환자는 화학 요법에서 심각하게 아픈이 될 것입니다.	M	환자는 대부분의 화학 요법 약물을 용인 할 수 있으며, 여러가 잘 용납입니다.
27	나는 HPV 백신을 얻을 경우, 더 이상 자궁 검사를 할 필요가 없습니다.	M	백신은 자궁 경부암에 대한 일반적인 검사에 대한 필요성을 제거하지 않습니다.
28	비타민과 각종 건강기능식품 항암 치료를 받는 동안 위험하다.	M	대부분의 비타민은 화학 요법 치료를하는 동안 취할 안전합니다.
29	내 파트너가 성병된 감염에 대 한 네거티브를 시험 하는 경우 그들은	M	남성과 여성 모두 HPV, 성기 사마귀 수축, 암을 얻을 수 있습니다.

	HPV 필요가 없습니다.		
30	HPV는 주로 동성애자들 사이에서 문제가있는 것입니다.	F	다른 사람과 섹스를 보유한 사람은 HPV를 얻을 수 있습니다.
31	HPV는 남성에 영향을 미칩니다.	M	남성과 여성 모두 자 궁, 생식 기 사마귀, 계약 하 고 (비록 여성만 얻을 자 궁 경부암 암 얻을 수 있습니다).
32	내 파트너가 HPV에 있는지 확인할 수 있습니다.	M	물리적으로 생식 기 사마귀를 사람이 하지 않으면 사람이 HPV 감염 되었는지 볼 수 없습니다.
33	HPV의 일부 유형의 암으로 이어질 것입니다.	F	HPV 백신은 바이러스에 감염되지 않습니다.
34	일부 유형의 HPV는 암으로 이어질 것입니다.	F	일부 HPV의 150 변종 원인이 암, 반면 다른 원인이 사마귀.
35	HPV는 인간 순도 바이러스의 약자입니다.	M	HPV는 인간 Papillomavirus을 의미합니다. 그것은 순수함과는 아무 상관이 없습니다.
36	HPV는 성적 접촉 만 통해 전송 될 수 있습니다.	M	피부에 직접 또는 간접적으로 접촉 바이러스를 전파 할 수 있습니다.
37	단 HPV의 한 종류가 있습니다.	M	HPV의 100 개 이상의 종류가 있습니다.
38	HPV에 감염된 사람의 피부와 접촉되어 사람은 HPV을 받게됩니다.	M	모든 사람의 면역 체계가 서로 다른이기 때문에, HPV에 접촉하게되어 모두가 HPV을 개발합니다.
39	여자들 만 HPV를 얻을.	M	남성과 여성 모두 HPV를 얻을 수 있습니다.
40	당신은 HPV받을 경우 증상을 받게됩니다.	M	HPV를 얻을 하는 사람들의 90 % 년 안에 그것을 지워집니다.
41	HPV는 항상 자궁 경부암으로 이어질 것입니다.	M	생식기 지역에 HPV는 자궁 경부암 발생합니다. 그러나 다른 암은 HPV에 의해 발생 될 수.
42	HPV는 항상 사마귀의 원인.	M	사마귀는 HPV에 의한 증상 이지만 때까지 자 궁 경부 암 처럼 고급 훨씬 다른 증상이 나타나지 않을 수 있습니다.
43	사마귀는 HPV로 인해 발생합니다	F	다른 자 궁 경부 암 (인간 유 두 종 바이러스) 긴장 사마귀 원인. 가까운 피부 대 피부 접촉 뿐만 아니라 수건 이나 신발과 접촉을 통해 사마귀를 일으키는 바이러스에 전달할 수 있습니다.
44	사마귀는 항상 암이 될	M	일부 사마귀는 손가락의 그것과 비슷한 생식기 없습니다. HPV에 의해 발생도 생식기 사마귀는 암으로 돌아하지

			않습니다. 생식기 사마귀를 일으킬 수 있습니다 HPV의 종류는 암을 일으킬 수있는 유형과 동일하지 않습니다.
45	당신은 HPV를하면 증상이 빠르게 표시됩니다.	M	HPV에 감염된다 대부분의 사람들은 심지어 그들이 가지고 모르겠어요. HPV 대부분의 사람들은의 증상이나 건강 문제를 개발하지 않습니다. 사람은 자신이 감염된 사람과 성적 접촉을 한 이후 년이 지나면 경우에도 HPV 수 있습니다. 대부분의 감염자들은 섹스 파트너에 바이러스를 전달하는 사람들이 감염 실현하거나하지 않습니다.
46	HPV를 방지 할 수있는 확실한 방법은 여러 섹스 파트너가있을 수 있습니다 파트너와 성관계를 방지하는 것입니다.	F	- HPV 생식 기 접촉을 통해 가장 자주 질 및 항문 섹스 하는 동안 전달 됩니다. 따라서 HPV를 피하기 위해 확실 한 방법은 여러 섹스 파트너를 가질 수 있는 파트너와 함께 섹스를 피하기 위해 이다.
47	성 기 사마귀 암에가 되지 않습니다.	F	만약 왼쪽으로 치료, 성 기 사마귀 수도 멀리 갈 하 또는 변함 없다, 크기 또는 수를 증가. 그들은 암으로 설정 하지 않습니다.
48	HPV 백신을 얻을 가장 좋은 시간은 12 년 정도입니다.	F	백신은 남성 및 여성 질환과 암으로 이어질 수 있는 자 궁의 가장 일반적인 유형 중 일부에 대해 보호할 수 있습니다. 이 백신은 3 타에 부여 됩니다. 그것은 최고의 보호를 받을 모든 3 개의 복용량을 얻는 것이 중요 합니다. 백신은 11 또는 12 세에 주어진 때 가장 효과적입니다.
49	콘돔이 HPV를 방지 할 수 있습니다.		성적으로 활동적인 것을 선택 하는 사람들을 위해 콘돔 HPV 위험을 낮출 수 있습니다. 가장 효과적인 솔직히, 그들은 처음부터 끝까지 모든 섹스 행위와 사용 해야 합니다. 콘돔 또한 생식 기 사마귀 및 자 궁 경부 암 등 자 궁 관련 질환을 개발의 위험을 낮출 수 있습니다. 하지만 HPV 콘돔 자 궁 으로부터 완전히 보호 하지 수 있도록 콘돔-에 의해 포함 되지 않는 영역을 감염 시킬 수 있습니다.

50	대부분의 자궁 경부 암에 대한 여성을 보호 수있는 두 백신 (Cervarix와 Gardasil) 이 있습니다.		Cervarix와 Gardasil 암을 방지 할 수 있습니다 HPV 백신입니다.
51	백신 (Gardasil) 은 남성과 여성에서 가장 성기 사마귀으로부터 보호 할 수 있습니다.		Gardasil이 작업을 수행 할 수 있습니다.
52	백신 (Gardasil) 은 남성과 여성에서 가장 항문 암으로부터 보호 할 수 있습니다.		Gardasil이 작업을 수행 할 수 있습니다.
53	HPV를 제거 할 치료는 없습니다.		바이러스 자체에 대한 치료가 없지만, HPV가 원인이 할 수있는 질병에 대한 치료가 있습니다.
54	자궁 경부의 암은 예방 할 수있는 가장 쉬운 암이다.		자궁 경부 암은 일반 전형 시험으로 방지하고 후속하는 가장 쉬운 여성 암입니다. 두 검사는 자궁 테스트 및 HPV 검사입니다.
55	HPV 검사는 HPV를 검색 할 수 있습니다.		HPV 검사는 세포 변화를 일으킬 수있는 바이러스를 찾습니다.
56	자궁 검사는 입원이 필요합니다.		자궁 시험은 의사의 사무실에서 수행 할 수 있습니다.
57	자궁 경부암 검사는 21 세 이후에 정기적으로 수행해야합니다.		자궁 경부암에 대한 심사 자궁 시험은, 가능한 가장 신뢰할 수 있고 효과적인 암 검사 시험 중 하나입니다.
58	자궁 경부암은 죽음을 의미합니다.		자궁 경부암은 수술, 방사선 및 화학 요법으로 치료를 할 수 있습니다.

Appendix C: Educational test questions and explanations in Vietnamese

Seq. Num.	Statement	Myth (M) Or Fact (F)	Explanation
1	Tôi không cần một thử nghiệm để tìm ung thư cổ tử cung. Tôi biết nếu tôi bị nhiễm HPV.	M	Nhiễm HPV là rất phổ biến ở phụ nữ. Tế bào cổ tử cung bị nhiễm có thể phát triển bất thường và năm sau đó chuyển thành ung thư.
2	Ung thư cổ tử cung gây tử vong vì vậy nó là tốt hơn cho tôi nếu tôi không biết rằng tôi bị ung thư.	M	Khi phát hiện sớm ung thư cổ tử cung có thể được điều trị thành công.
3	Bạn có thể ngăn ngừa ung thư cổ tử cung.	F	Ung thư cổ tử cung có thể được điều trị.
4	Yêu cầu về vắc xin HPV sẽ cho biết rằng một trong những là sinh hoạt tình dục.	M	Hỏi về thuốc chủng ngừa HPV có nghĩa là ai muốn biết thêm thông tin để ngăn chặn nó.
5	Thuốc chủng ngừa HPV sẽ không tác động tiêu cực đến khả năng sinh sản của người phụ nữ trong tương lai.	F	Không có bằng chứng cho thấy rằng thuốc chủng ngừa HPV tác động tới khả năng sinh sản.
6	HPV và HIV là không tương tự và chiến lược phòng ngừa là không giống nhau.	F	HPV và HIV là rất khác nhau và phương pháp tiếp cận phòng ngừa cũng khác nhau.
7	Nếu một người trung thành trong mối quan hệ và chỉ có một bạn tình, cô vẫn cần chủng ngừa HPV và nguy cơ ung thư cổ tử cung.	F	Vì HPV là rất phổ biến, có một đối tác không đảm bảo bảo vệ chống lại ung thư cổ tử cung.
8	Nếu tôi cho phép con trai tôi kết hôn với một người phụ nữ bị ung thư cổ tử cung con cái của họ sẽ không được sinh ra với bệnh ung thư.	F	Những phụ nữ bị ung thư cổ tử cung không truyền nó trên cho con cái của họ.
9	Con gái tôi còn quá trẻ, và không có quan hệ tình dục, vì vậy cô không có nguy cơ. Cô ấy không cần phải được chủng ngừa HPV.	M	Thuốc chủng ngừa HPV hiệu quả nhất khi trao cho thanh thiếu niên trước khi họ bắt đầu có quan hệ tình dục.
10	Nếu tôi là duy nhất tôi sẽ không nhận được HPV.	M	HPV lây lan qua đường tình dục, nhưng virus này là rất phổ biến và có thể lây lan qua tiếp xúc với da bị nhiễm mà không cần quan hệ tình dục.
11	HPV có thể lây lan qua đường tình dục bằng miệng.	F	HPV có thể được truyền qua đường tình dục bằng miệng.
12	HPV có thể được truyền qua các dịch cơ thể (máu và tinh dịch) và sử dụng bao cao su thành công có thể ngăn ngừa lây truyền HPV.	M	Vì HPV không lây truyền qua chất dịch của cơ thể, sử dụng bao cao su không hoàn toàn bảo vệ một trong những từ hợp đồng HPV.
13	Vài người đã sinh hoạt tình dục sẽ hợp đồng HPV.	M	Ít nhất 50% những người có hoạt động tình dục sẽ bị nhiễm HPV.
14	Ung thư cổ tử cung không có triệu chứng.	M	Chảy máu sau khi giao hợp, chảy máu giữa chu kỳ kinh nguyệt hoặc chảy máu sau khi

			mãn kinh có thể chỉ ra ung thư cổ tử cung. Các triệu chứng khác bao gồm đau ở vùng xương chậu.
15	Chỉ những phụ nữ lớn tuổi sẽ bị ung thư cổ tử cung.	M	Trong khi nguy cơ ung thư cổ tử cung tăng lên cùng với tuổi tác, phụ nữ nên đi xét nghiệm Pap bắt đầu ở tuổi 21.
16	Hút thuốc làm tăng nguy cơ ung thư cổ tử cung.	F	Hút thuốc làm tăng nguy cơ ung thư cổ tử cung cùng với các yếu tố khác.
17	Điều trị ung thư cổ tử cung đòi hỏi tôi phải đặt cuộc sống của tôi giữ lại.	M	Trong khi điều trị là gây rối, hầu hết các bệnh nhân có thể sống một cuộc sống sản xuất, chẳng hạn như trong công việc hay trường học.
18	Các biện pháp khắc phục hậu quả thay thế là một lựa chọn phù hợp với hóa trị và phẫu thuật.	M	Điều trị truyền thống như hóa trị và phẫu thuật cung cấp cơ hội tốt nhất để chống ung thư.
19	Khi một người phụ nữ bị nhiễm vi rút HPV, họ bị nhiễm cho cuộc sống.	M	Hầu hết phụ nữ trẻ, những người bị nhiễm HPV sẽ rõ ràng lây nhiễm ban đầu trong vòng 6 tháng.
20	Ung thư cổ tử cung không phải là truyền nhiễm.	F	Trong khi HPV có thể được truyền qua đường tình dục, các tế bào ung thư không thể được lây từ người sang người.
21	Xét nghiệm Pap bình thường có nghĩa là một người phụ nữ không có bệnh ung thư.	M	Xét nghiệm Pap chỉ sàng lọc ung thư cổ tử cung hoặc các tế bào tiền ung thư cổ tử cung. Không có xét nghiệm tầm soát ung thư tử cung hoặc buồng trứng.
22	Xét nghiệm Pap là cách tốt nhất để màn hình một người phụ nữ đối với các bệnh lây truyền qua đường tình dục (STDs).	M	Xét nghiệm Pap chỉ sàng lọc ung thư cổ tử cung hoặc các tế bào tiền ung thư cổ tử cung. Các bệnh lây truyền qua đường tình dục khác yêu cầu kiểm tra riêng biệt.
23	Nếu một hoạt động được thực hiện để loại bỏ ung thư, ung thư sẽ lan truyền khi cơ thể được mở ra.	M	Tiếp xúc của các khối u không khí trong quá trình phẫu thuật không gây ra chúng để lây lan.
24	Những phụ nữ trẻ hơn 50 tuổi không cần liệu pháp thay thế hormone khi trải qua phẫu thuật.	F	Phần lớn các bệnh ung thư cổ tử cung có thể được điều trị bằng phẫu thuật không đòi hỏi buồng trứng được loại bỏ.
25	Xạ trị sẽ không gây ra tóc của tôi rơi ra ngoài.	F	Khi bức xạ được sử dụng để điều trị ung thư cổ tử cung, bệnh nhân không bị mất tóc của họ.
26	Hóa trị sẽ làm cho bệnh nhân như chết bệnh.	M	Bệnh nhân có thể chịu đựng được hầu hết các loại thuốc hóa trị, và hầu hết các thuốc được dung nạp rất tốt.
27	Nếu tôi nhận được thuốc chủng ngừa ung thư cổ tử cung, tôi sẽ không cần phải có xét nghiệm Pap nữa.	M	Thuốc chủng này không loại bỏ sự cần thiết phải kiểm tra thường xuyên đối với ung thư cổ tử cung, bao gồm cả việc thực hiện các xét nghiệm Pap thường xuyên.
28	Vitamin và bổ sung sức khỏe nguy hiểm trong khi được hóa trị.	M	Hầu hết các vitamin được an toàn khi sử dụng trong điều trị bằng hóa trị.
29	Nếu đối tác của tôi đã thử nghiệm tiêu cực các bệnh nhiễm trùng lây truyền qua đường tình dục, sau đó họ không bị nhiễm HPV.	M	Các nhà cung cấp có thể không kiểm tra HPV, ngay cả ở phụ nữ, trừ khi xảy ra một kết quả bất thường trên một thử nghiệm Pap.
30		F	Bất kỳ ai có quan hệ tình dục với một người

	HPV chủ yếu là một vấn đề giữa các người đồng tính luyến ái.		khác có thể nhận được sự lây nhiễm HPV.
31	HPV cũng ảnh hưởng đến nam giới.	M	Cả nam giới và phụ nữ có thể hợp đồng HPV, mụn cóc sinh dục, và mắc bệnh ung thư (mặc dù phụ nữ chỉ nhận được ung thư cổ tử cung).
32	Tôi có thể nói nếu đối tác của tôi có HPV.	M	Bạn có thể không thể chất nhìn thấy nếu một người có bị nhiễm HPV, trừ khi người có mụn cóc ở bộ phận sinh dục.
33	Tiêm phòng HPV không lây nhiễm một virus.	F	Những vaccine không chứa bất kỳ virus sống hay đã chết và không thể lây nhiễm HPV.
34	Không phải tất cả các loại HPV sẽ dẫn đến ung thư.	F	Chỉ có một số trong số 150 chủng HPV gây ung thư, trong khi những người khác gây ra mụn cóc.
35	HPV là viết tắt của Virus Purity nhân lực.	M	HPV là viết tắt của Human Papillomavirus.Nó không có gì để làm với "Thanh Tịnh".
36	HPV chỉ có thể được truyền qua quan hệ tình dục.	M	HPV cũng có thể được truyền qua nếu ai đó đã chạm vào một chiếc khăn hoặc đối tượng khác đã được sử dụng bởi những người có siêu vi khuẩn.
37	Có chỉ có một loại HPV.	M	Có hơn 100 loại HPV.
38	Bất cứ ai tiếp xúc với da của một người bị nhiễm HPV sẽ bị nhiễm HPV.	M	Hệ thống miễn dịch của mọi người là khác nhau, do đó, không phải tất cả những người tiếp xúc với HPV sẽ phát triển HPV.
39	Chỉ những phụ nữ bị nhiễm HPV.	M	HPV của vùng sinh dục gây ra ung thư cổ tử cung. Tuy nhiên, các bệnh ung thư khác có thể được gây ra bởi HPV bao gồm ung thư âm hộ, âm đạo, dương vật, hậu môn, và hầu họng
40	Nếu bạn bị nhiễm HPV, bạn sẽ nhận được các triệu chứng.	M	Hệ thống miễn dịch của 90% những người nhiễm HPV sẽ rõ ràng trong vòng hai năm.
41	HPV luôn luôn gây ra ung thư cổ tử cung.	M	HPV của vùng sinh dục gây ra ung thư cổ tử cung. Tuy nhiên, các bệnh ung thư khác có thể được gây ra bởi HPV bao gồm ung thư âm hộ, âm đạo, dương vật, hậu môn, và hầu họng
42	HPV luôn luôn gây ra mụn cóc.	M	Mụn cóc là một triệu chứng của HPV nhưng các triệu chứng khác có thể không xuất hiện cho đến khi họ đang có nhiều tiến bộ như ung thư cổ tử cung và ung thư âm hộ, âm đạo, dương vật, hậu môn, và hầu họng (cổ họng bao gồm cả cơ sở của lưỡi và amiđan).
43	Mụn cóc gây ra bởi HPV	F	HPV khác nhau gây ra mụn cóc. Virus gây mụn cóc có thể được thông qua tiếp xúc da với da gần, cũng như thông qua tiếp xúc với khăn tắm hoặc giày.
44	Mụn cóc sẽ luôn luôn trở thành ung thư.	M	Một số mụn cóc ở bộ phận sinh dục giống như trên ngón tay. Ngay cả mụn cóc sinh dục do HPV gây ra sẽ không trở thành ung

			thư. Các loại HPV có thể gây mụn cóc ở bộ phận sinh dục không giống như các loại có thể gây ung thư.
45	Nếu bạn bị nhiễm HPV, các triệu chứng sẽ hiển thị một cách nhanh chóng.	M	Hầu hết những người bị nhiễm HPV thậm chí không biết họ có nó. Hầu hết những người nhiễm HPV không phát triển các triệu chứng hoặc các vấn đề về sức khỏe từ nó. Một người có thể bị nhiễm HPV ngay cả khi năm đã trôi qua kể từ khi anh ta hoặc cô ta đã có quan hệ tình dục với người có bệnh.
46	Một cách chắc chắn để tránh HPV là tránh quan hệ tình dục với một đối tác người có thể có nhiều bạn tình.	F	HPV được truyền qua tiếp xúc sinh dục, thường xuyên nhất khi quan hệ tình dục âm đạo và hậu môn. Do đó cách chắc chắn để tránh HPV là tránh quan hệ tình dục với một đối tác người có thể có nhiều bạn tình.
47	Mụn cóc sinh dục không trở thành ung thư.	F	Xét nghiệm Pap, sàng lọc ung thư cổ tử cung, là một trong những xét nghiệm sàng lọc ung thư đáng tin cậy và hiệu quả nhất có sẵn.
48	Thời gian tốt nhất để có được thuốc chủng ngừa HPV là khoảng mười hai tuổi.	F	Vắc xin có thể bảo vệ nam và nữ đối với một số loại phổ biến nhất của HPV có thể dẫn đến bệnh tật và ung thư. Các vắc-xin được chích làm ba lần. Điều quan trọng là để có được tất cả ba liều để được bảo vệ tốt nhất. Các loại vắc xin có hiệu quả nhất khi được dùng ở 11 hoặc 12 tuổi.
49	Bao cao su có thể giúp tránh HPV.	F	Đối với những người có hoạt động tình dục, bao cao su có thể làm giảm nguy cơ nhiễm HPV.Bao cao su cũng có thể giảm nguy cơ phát triển các bệnh liên quan đến HPV, chẳng hạn như mụn cóc sinh dục và ung thư cổ tử cung. Nhưng HPV có thể lây nhiễm sang các khu vực không được bao phủ bởi bao cao su.
50	Có hai loại vắc xin (Cervarix và Gardasil) có thể bảo vệ phụ nữ chống lại hầu hết các ung thư cổ tử cung.	F	Cervarix và Gardasil là có thật và tránh ung thư cổ tử cung.
51	Một loại vắc xin (Gardasil) có sẵn để bảo vệ chống lại hầu hết các mụn cóc sinh dục ở nam và nữ.	F	Gardasil có sẵn cho mục đích này.
52	Một loại vắcxin (Gardasil) có sẵn để bảo vệ chống lại hầu hết các ung thư hậu môn ở nam và nữ.	F	Gardasil có sẵn cho mục đích này.
53	Không có điều trị để loại bỏ HPV.	F	Không có điều trị cho bản thân virus, nhưng cũng có những phương pháp điều trị đối với các bệnh mà HPV có thể gây ra.
54	Ung thư cổ tử cung là loại đơn giản nhất của bệnh ung thư để ngăn chặn.	F	Ung thư cổ tử cung là loại ung thư phụ nữ dễ nhất để ngăn ngừa, với các xét nghiệm sàng lọc thường xuyên và theo dõi.
55	HPV thử nghiệm có thể phát hiện HPV.	F	Xét nghiệm HPV tìm kiếm các virus có thể gây ra những thay đổi tế bào.

56	Xét nghiệm Pap yêu cầu nhập viện.	M	Xét nghiệm Pap được khuyến khích cho tất cả phụ nữ trong độ tuổi từ 21 và 65 tuổi, và có thể được thực hiện trong văn phòng của bác sĩ hoặc phòng khám.
57	Phụ nữ nên có xét nghiệm Pap thường xuyên bắt đầu từ 21 tuổi.	F	Xét nghiệm Pap, sàng lọc ung thư cổ tử cung, là một trong những xét nghiệm sàng lọc ung thư đáng tin cậy và hiệu quả nhất có sẵn.
58	Ung thư cổ tử cung có nghĩa là chết.	M	Ung thư cổ tử cung, nếu phát hiện sớm có thể được điều trị và chữa khỏi.

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