

An Integrated Model of Supporting Gender-Inclusivity in Educational Games

By

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Introduction

Game based learning is a type of game play that has defined learning outcomes. Game based learning has been an important part of the teaching community because of its advantages. The new learning technology needs to be appropriate for all students and ensure equal learning opportunities. However, the use of computer games in education has been criticized, primarily on gender issues. Plenty of researches have proven that the majority of people who played computer games were males. The female characters are rarely cast in major roles in male-oriented computer games ^[1].

A large number of research on gender differences in the context of computer games call for an according considerations and reflections in game design and development and for gender-inclusivity games. By the early 1990s, educational researcher began investigating the elements of computer games to study gender differences on educational games. In the earlier stage, girl games were launched such as fashion, horoscopes and romance--resulting in so-called 'pink software' such as *My Little Pony*. This attempt to create special girl games, however, did not always succeed ^[2] because it created a small niche market and excluded a larger market of male

players and even female players who do not like pink. After the misses of the pink games, purple games designed for appealing girls focus on real world interests such as building connections or friendships and sharing. One successful purple game is the *Nancy Drew* game series that received Parents' Choice Award 22 times for best software. The game series is based on the popular book *Nancy Drew* that is about an amateur detective solving crimes using her unique problem solving approach and independent attitude. After more than one decade of girl game development, so far the large popular and commercial games are still being designed, developed, and marketed with the male player in mind. In the last ten years most award-winning games were still designed for male audience. A few successful exceptions were designed for both male and female audiences. One is *The Sims*, a life simulation genre in 2000 and the other one is *Little Big Planet*, a platform genre in 2009. Learning from successful games might provide design guides that made these games popular among boys and girls.

Purpose of the Research

This research is to build an integrated model that promotes a methodological approach to support the design of gender-inclusive educational game.

Methodology

This research is entirely literature-based. A crucial step is to identify the research content. A comprehensive literature review ^[4] contributes to identify all the dimensions related to the content domain.

1.Computer Games in Education

Video games and computer games are playing an increasing role in school as teachers seek to deliver core lessons in a format that stimulate students' interests. This is a good way to allow students to take a more active role in learning as they develop the technologies skills.

A major controversy in education computer games involves around issues of gender and sexism. Most computer games including educational games typically have been designed for males. A number of researchers questioned whether such games can appeal equally to girls and to boys and girls and boys can learn equally well from computer games.

As noted by Hart ^[5], it is readily apparent to any researcher that the majority of characters in the computer-game universe are male and that the majority of the games are specifically designed to appeal to boys. According to Gailey ^[6], preadolescent boys are the major targets for computer games. He also mentioned the depiction of women is consonant with the range of masculine fantasies. The female characters in computer games typically are shapely and attired in skimpy clothing. The female characters rarely are lead characters and rarely have active roles. To alleviate the gender imbalance in computer game market, the industry recently introduced a number of female heroines. However most female characters were not introduced as role of

models for girls but fantasy sexual objects for boys and men. Charges of sexism also have been against educational computer games.

2.Game Categories

a. Rating Categories

Rating Categories suggest age appropriateness. The Entertainment Software Rating Board (ESRB) provides six categories. They are Early Childhood (eC), Everyone (E), Everyone 10+ (E10+), Teen (T), Mature (M), Adults Only (Ao) and Rating Pending (RP).

Early Childhood (eC) is intended for young children. Everyone (E) is generally suitable for all ages and may contain minimal cartoon, fantasy or mild violence and/or infrequent use of mild language. Everyone 10+ (E10+) is generally suitable for ages 10 and up and may contain more cartoon, fantasy or mild violence, mild language and/or minimal suggestive themes. Teen (T) is generally suitable for ages 13 and up and may contain violence, suggestive themes, crude humor, minimal blood, simulated gambling and/or infrequent use of strong language. Mature is generally suitable for ages 17 and up may contain intense violence, blood and gore, sexual content and/or strong language. Adults Only (Ao) is generally suitable only for adults ages 18 and up may include prolonged scenes of intense violence, graphic sexual content and/or gambling with real currency. Rating Pending (RP) is not yet assigned a final ESRB rating. For example, a game with intense violence, blood, gore and strong language, such as *Batman: Arkham Knight*, will be rated

as ‘M’, while *Sesame Street: Elmo's A-to-Zoo Adventure* is rated as ‘eC’ that is intended for young children and of educational nature.

b. Game Genre

One of the earliest descriptions of genre was proposed by Herz ^[7] and consists of eight genres, action games, adventure games, fighting games, puzzle games and role-playing games, simulation, sport games and strategy games. A game genre summary is shown in table 1. Fighting games is classified into action genre. Additional six genres are added. Some may have been a subset of another genre but have grown into a genre by themselves to reflect the variety of genres available in the market today. For example, although the shooting genre was a sub-genre of action genre, a majority of games in the action genre are shooting games, which accounted for 12% of the bestselling video games in 2009.

Game Genre	Description	Examples
Action	Action games are typified by fast-paced events and movements which often have to be performed reflexively.	-Space Invaders - Pong

Adventure	Typically the player is the protagonist of a story. Interacting with in-game objects and characters	-King's Quest -Fahrenheit
Puzzle	Solving puzzles. The types of puzzles can test many problem-solving skills including logic, pattern recognition, sequence solving, and word completion.	-Shadow of the Colossus - Mahjong solitaire
Role-playing	Often characterized in terms of providing the player with flexibility in terms of character development, problem resolution, etc.	-Final Fantasy -Wasteland -Baldur's Gate
Simulation	Many simulation games aim to simulate physical activities such as flying an	-Flight Simulator -SimCity

	<p>aircraft.</p> <p>Other forms of simulation game aim to provide simulations of forms of management.</p> <p>Often the simulation is intended to be fun as opposed to accurate.</p>	<p>-Wing Commander</p>
Strategy	<p>Real-time strategy games defined a number of goals around resource collection, base and unit construction and engagement in combat with other players or computer opponents who also share similar goals.</p> <p>Turn-based games share similar aims to real-time</p>	<p>-Dune 2</p> <p>-Civilization</p>

	strategy games although players take turns in much the same way as with many traditional board games.	
Sports	Simulating the sporting experience – including sports such as football, baseball, golf, etc.	-Tiger Wood's Golf -FIFA soccer
Racing	Typically place the player behind the wheel and involve competing in a race against other drivers and/or time.	-Pole Position -GTR
Classic/Board	Computerized versions of board, word, and card games	-Mahjongg -Backgammon

Platform	Requiring the protagonist to run and jump between surfaces (i.e. platforms) whilst avoiding game objects and the detrimental effects of gravity.	-Pitfall! -Super Mario Bros
Shooting	A main objective is to shoot opponents or enemies to complete a mission while trying to survive the scenario.	-Alone in the Dark -Resident Evil
Children	Usually educational and teaching new skills, which can span from pre-school onwards.	-Carmen Sandiego series -Mavis Beacon Teaching
Rhythm	Requiring the player to	-Dance Dance Revolution

	undertake some action in response to some stimulus (often music).	
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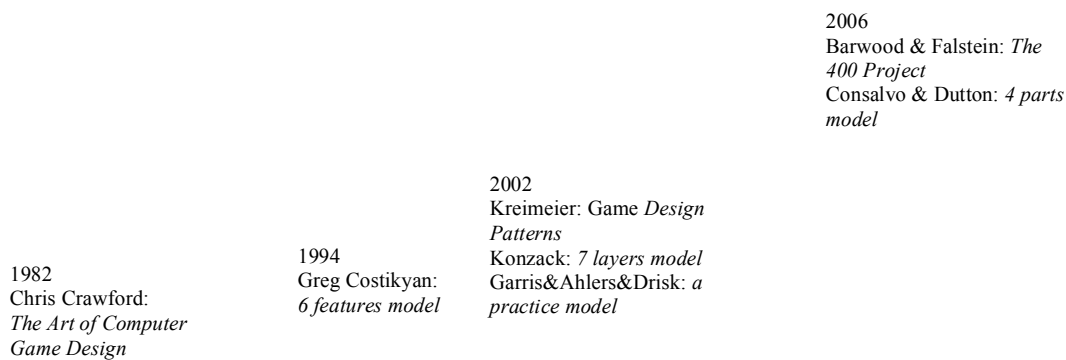
Table 1. Summary of Game genre

3.Previous game models

Research on previous game models help to understand how the games are created that better guide game design in the future.

In 1982 Chris Crawford published *The Art of Computer Game Design*, which outlines the common factors to consider when design a game. Since 1982, many other game designers have followed suit to document and share their design methodologies. The Figure 1 illustrates the timeline of game models. 15 game models were found within the last decade from 2001 to 2008.

There were only two models in the early stage.



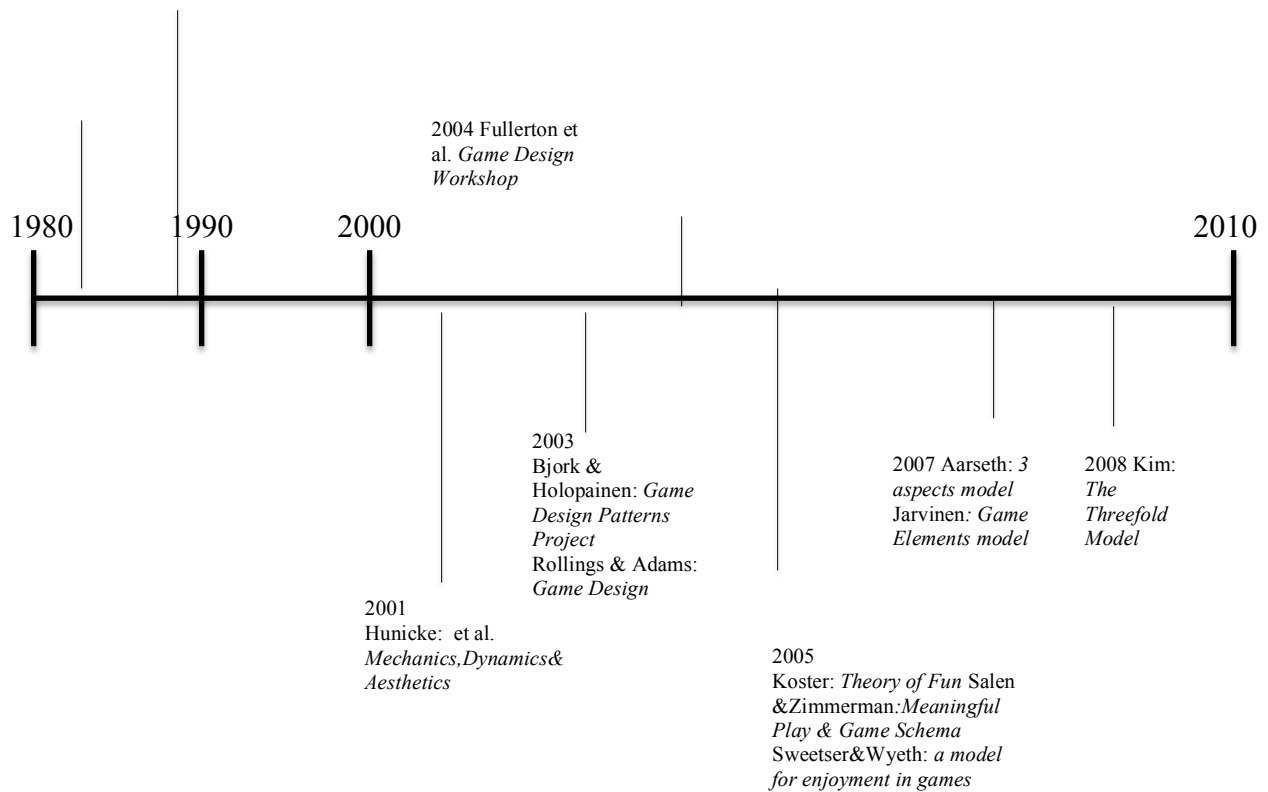


Figure 1. The timeline of game models

Based on analysis of 17 game models, I produced a synthesis list with four themes: (1) gameplay, (2) aesthetics, (3) narrative, and (4) interaction. Components are identified in each theme that best describe the components. The combination of these components reversely characterizes the theme as a whole. Table 2 shows four themes and their components.

Themes	Components	References
Total 4 themes	Total 19 components	
Gameplay: Game goals are	<ul style="list-style-type: none"> Goals/Objectives 	Crawford, 1982 ^[8]

the core concept of game design, on which all factor design should be based.	<ul style="list-style-type: none"> • Conflict • Challenge • Fun/Play • Rules/Patterns • Feedback/Outcomes • Safety • Balance 	<p>Costikyan, 1994^[9]</p> <p>Hunicke et al., 2001^[10]</p> <p>Kreimeier, 2002^[11]</p> <p>Garris&Ahlers&Driskell, 2002^[12]</p> <p>Rollings&Adams, 2003^[13]</p> <p>Fullerton et al., 2004^[14]</p> <p>Salen&Zimmerman, 2005^[15]</p> <p>Sweetser&Wyeth 2005^[16]</p> <p>Koster, 2005^[17]</p> <p>Jarvinen, 2007^[18]</p>
Aesthetics: game value factors that makes game fun	<ul style="list-style-type: none"> • Theme • Game world • Mystery • Visual stimuli and Auditory stimuli 	<p>Hunicke et al., 2001^[10]</p> <p>Fullerton et al., 2004^[14]</p> <p>Jarvinen, 2007^[18]</p>

Narrative/Sensation: game fantasy factors composing the virtual world and can be perceived directly by players	<ul style="list-style-type: none"> • Backstory • Plot • Storytelling 	Hunicke et al., 2001 ^[10] Garris&Ahlers&Driskell, 2002 ^[12] Rollings&Adams, 2003 ^[13] Koster, 2005 ^[17] Kim, 2008 ^[19]
Interaction/Freedom : game mechanism enabling smooth functioning of virtual world and promoting player actions under game goals	<ul style="list-style-type: none"> • Functionality • Interface Style • Navigation • Character Controls 	Crawford, 1982 ^[8] Garris&Ahlers&Driskell, 2002 ^[12] Rollings&Adams, 2003 ^[13] Sweetser&Wyeth 2005 ^[16] Jarvinen, 2007 ^[18]

Table 2 Themes and core components from game model research

Components	Description
Game Goals	Game designer provides what type of experience for players

Game Conflict	Conflict is designed into the game by creating rules and procedures that prevent players from accomplishing their goals directly.
Game Challenge	Refers to player efforts toward the game or personal goals.
Fun/Play	Refers to enjoyment, pleasure and intense and passionate involvement in games.
Game Rules	Refers to game structures. They are often defined by rules.
Feedback/Outcomes	Refers to players' learning in the process of play
Game Safety	The result of game are always less harsh than the situations the game models.
Game Balance	Refers to the practice of tuning a game's rule, with the goal of preventing any of its component system from being ineffective.
Game theme	Refers to the experience of players when players play the game.
Game world	Refers to an artificial universe.
Mystery	Refers to providing a novel experience for

	players, including curiosity and exploration.
Visual stimuli/ Auditory stimuli	Refers to things that cause organs or tissues to react in a certain way.
Backstory/Plot/Storytelling	Refers to a story that tells what led up to the main story or plot.
Functionality	Player operations that trigger the computer to generate related response, including the interactions and conflicts between players and computers.
Interface style	Refers to an interface between the game and something else (typically, a player).
Game Navigation	Games take player on a journey where you'll pass navigation aids.
Character Control	Games offer a group of player characters for the player to choose from, allowing the player to control one of them at a time.

Table 3 Game Components

From table 2, most components (eight components) concentrated in the gameplay theme, while aesthetics theme has four components and interaction theme has four components and narrative theme has three components. The way to use components depends on the type of game

designed. For example, prince of Persia belongs to action-adventure genre that requires a rich game world with a variety of objects and scenes. However, Tetris is a puzzle game that does not require a wide range of avatars to select.

Undoubtedly, game design is the art of applying design and aesthetics to a game. Especially educational games merge many disciplines including computer science, history, media, economics, math, physics and business and other factors including gender issues, which bring a certain level of complexity to the design process. Though recently some game design models have been well documented, how to evaluate a particular game design model that will do what it says it can do is still a question. Few references elaborated on this issue. Hence research on existing design model and understanding their components link design process to games. This will help us deeply understand what goes into the process and what considerations are needed to make during design and development. A collection of game design principles can be developed.

4. Gender Roles and Gender Differences

In order to well understand gender difference in games, it is necessary to know general gender roles and differences. There are four principle psychological explanations of gender-linked behavior patterns: Freudian's theory's process of identification ^[20], cognitive social learning theory ^[21], gender-schema ^[22] theory and Kohlberg's cognitive developmental theory ^[23].

The process by which children acquire the values, motives, and behaviors viewed as appropriate for males and females within a culture is called gender typing. Children develop gender-based beliefs, largely on the basis of gender stereotypes; the latter are reflected in gender

roles. Children adopt a gender identity early in life and develop gender-role preferences as well.

a. Gender stereotypes

Numerous studies have shown boys reflect more independent, assertive and competitive while girls reflect more passive, sensitive and supportive.

b. Gender difference in development

Girls are more physically and neurologically advanced at birth. Boys are more mature muscular development but are more vulnerable to disease and hereditary anomalies. Girls excel early in verbal skills, but boys excel in visual-spatial and math skills. Boys are more aggressive, and girls more defensive. Boys have more reading, speech, and emotional problems than girls. There are no obvious gender differences in sociability, conformity, achievement, self-esteem, or verbal hostility.

Children develop gender-typed pattern of behavior and preferences as early as 15-36 months. Boys tend to more adhere to the masculine role possibly because there is greater pressure from parents and teachers. Girls also play the male role because it has greater status and privilege in our culture. Though cross-gender behavior is welcome in our current culture, most children are encouraged to behave according to traditional stereotypes.

c. Biological factor in gender differences

I. Hormones, social behavior and cognitive skills

Biological factors include hormones and lateralization of brain function. During the prenatal period, hormones may organize biological predisposition to be masculine or feminine, and the increase in hormones during puberty may activate that predisposition. Social experiences may alter the levels of hormones, such as testosterone.

II. Brain Lateralization and Gender Differences

Gender differences in the organization of the brain may be reflected in the greater lateralization of brain functioning in males, which may help explain male success at spatial and math skills. It may also explain female tendencies to be more flexible than males and to withstand injury to the brain more effectively.

Environmental and cultural expectations are also influential in boys and girls developing nontraditional gender-based abilities and interests.

d. Cognitive factors in gender differences

Kohlberg's three-stage cognitive developmental theory of gender typing suggests that children begin by categorizing themselves as male or female, and then feel rewarded by behaving in gender-consistent ways. To do this, they must develop gender identity, gender stability, and gender constancy. We should not see gender-typed behavior until after gender constancy is reached (around 6 years old). However, gender-typed toy and activity preferences are seen much earlier. So the acquisition of gender concepts and behavior varies depending on gender understanding and kind of behavior.

e. Influence of parents and teachers on gender typing

Boys and girls are viewed and treated differently by their parents. Boys are expected to be stronger and treated more roughly. Girls are more protected and allowed less autonomy than boys. Girls are not expected to achieve as much in the area of their future careers as are boys.

Teacher treated boys and girls differently. Due to the emphasis in school on typically feminine characteristics such as quietness, obedience, and passivity, girls tend to perform better than boys in the early grades. Boys receive more criticism even in preschool from teachers, who react to children in gender stereotypic ways that may lower boys' motivation and interest in school activities, leading to learning problems found in boys during the early grades.

Conforming and dependent behaviors encouraged in girls may be detrimental for their later academic success. For example, even if in many areas girls do as well as boys, girls are not encouraged to excel in these areas.

f. Other influences on gender roles

Male and female roles are portrayed in gender-stereotypic ways in television and many children's books. Males are more likely than females to be portrayed as aggressive, competent, rational, and powerful in the workforce. Females are more often portrayed as involved primarily in housework or caring for children. Females are less likely to be leading characters on TV, and male characters are over represented in children's books although some changes towards equal treatment has occurred in recent years.

Children who have masculine or androgynous characteristics are likely to have higher self-esteem than those who have traditionally feminine characteristics. However, children are likely

to react when other children violate gender-typical behavior. Boys with cross-gender behavior can receive negative reactions from peers.

Many people possess both masculine and feminine characteristics. Children who are more androgynous make less stereotyped play and activity choices. In recent years, gender differences are encouraged to reduce especially in education. And some research ^[24] shows children's gender stereotypes can be reduced. They are multi-schematic, holding more than one gender schema for responding to the world.

5. Games and Gender

Current most games are designed with a focus on gender exclusive preferences that causes gender stereotype problems. Most popular games are designed for male players with excessive violence, bloody and gore, which may not appeal to many female players. Games like Batman series, God of War series portray extreme violence. Developer Rocksteady Studio of Batman borrows thrilling fighting and voice acting elements. Another example is God of War, which include suicide, genocide and violence against women and children.

On the contrary, when games are designed for female players, themes focus on pinkness, fashion, cooking and wedding. These games focus on stereotypical female roles. For example, Cake Shop 2, in this game player must run a cake shop by keeping customers happy. Another example is Wedding Dash, which is to plan for the perfect wedding by selecting food, honeymoon and specific theme.

The games discussed above are gender-specific games, where the main audience is either

male or female players. The gender-specific games obviously highlight gender stereotypes.

Games such as The Sim, World of Warcraft (WoW) are more neutral that appeal to both male and female players. WoW offer much more than killing other players, such as auction, profession, collecting pets, role playing and treasure hunting. The questions that arise from this situation are how to make games appealing and how to design games with similar appealing.

Gender inclusivity in game is analyzed below.

Elements	Boys	Girls	Gender inclusivity
Violent action	Prefer direct or overt competition [25]; The need to beat the game and win.	Prefer a secretive way; Enjoy the game story and establish emotional attachment ^[25] .	<ul style="list-style-type: none">• Focus on games that do not directly harm opponents in games such as racing car, finding the clue.• Resolve conflict through a peaceful way such as negotiating with enemies, giving gifts to enemy etc.• Discover the game through compelling story using plot twist,

			conflict and diversified appealing character.
Risk-taking	More likely take risks.	Look forward to positive results; Avoid risks ^[26] ; Seeking understanding before playing.	<ul style="list-style-type: none">• Provide enough information in the background for understanding the story of game.• Provide guided tutorial for players to practice their skills before playing next level.• Make game instructions easy by clicking an icon on the

			screen during playing.
Reward and penalty	Prefer violence as a prominent feature of punishment	Exhibit passive feedback with an opportunity improvement, Like games to continuously play even if a mistake is made; Pay more attention to the game experience rather than results.	<ul style="list-style-type: none"> • Allow continuity without sudden end or a violent penalty by saving a multiple versions of a scenario. • Prolong a game role's life by regaining energy through food, rest or finding something.
Challenges	Tend to design game theme that allow them to	Create games that involve 'doing	<ul style="list-style-type: none"> • Design multiple ways to solve a

	get something through adventure exploration ^[27] .	something' without finding objects treating the game as activity itself ^[28] .	problem. <ul style="list-style-type: none">• Present a variety of activities, such as puzzle, adventure in a game.• Split tasks for an objective, such as solving a puzzle to get a clue to complete another task.
Collaborat ion		More willing to take a risk in a social decision making setting ^[29] .	<ul style="list-style-type: none">• Collaborative gameplay between two or more players.
Genre	Strategy/Sports/Action/Ad venture	Puzzles/Board Card/Quizzes/Educa tional games.	<ul style="list-style-type: none">• Present a combination of game activities

Visual and auditory stimuli	Tend to show a physiological reaction.	Need an emotional or tactile stimulus to elicit the same response ^[30] .	<ul style="list-style-type: none">• Provide a variety of music styles.• Depict realistic graphics in a wide of range of color shades and scenes.• Develop a compelling story using plot twist, conflict and diversified appealing character.
Avatar			<ul style="list-style-type: none">• Present a balanced representation of characters by providing an

			<p>equal number of male and female characters for selection.</p> <ul style="list-style-type: none">• Personalized character design by modifying a player's chosen avatar characteristics such as name, facial feature, etc.• Provide a wide range of avatar's physical appearance• Provide a wide range of roles and personality
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			traits
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Table 4. Gender-inclusivity in games

Based on discussion on Table 4, eight elements can be compressed into four themes. The summary is shown in Table 5.

Theme	Components
Total 4 themes	Total 14 components
Game experience	<ul style="list-style-type: none"> • Learning/Feedback • Conflict/ Challenges • Visual and auditory stimuli • Risk-taking • Reward and penalty
Game content	<ul style="list-style-type: none"> • Game genre • Story/plot • Game world • Game character
Game environment	<ul style="list-style-type: none"> • Collaborative or competitive

	<ul style="list-style-type: none">• Action or non-action
Game design style	<ul style="list-style-type: none">• Activity types• Result management• Flexibility

Table 5. Themes and core components from gender and games research

6. An Integrated Model of Gender Aspects in Educational Computer Games

a. The development process of the model

Summarize components from previous game model research and gender-game research including pedagogical components.



Group these components into appropriate themes.



Reclassify components, possibly creating new component name to reflect gender inclusivity.



Develop the integrated model by combining new themes and new components.

Themes and components have been discussed in table 2 and table 5. For better compare them, the combination is show table 6.

Theme	Components from game model research	Theme	Components from gender-game research
Gameplay	<ul style="list-style-type: none"> • Goals/Objectives • Conflict/Challenge • Fun/Play • Rules/Patterns • Feedback/Outcomes • Safety • Balance 	Game experience	<ul style="list-style-type: none"> • Learning/Feedback • Conflict/ Challenges • Visual and auditory stimuli • Risk-taking • Reward and penalty
Aesthetics	<ul style="list-style-type: none"> • Theme • Game world • Mystery • Visual stimuli and 	Game content	<ul style="list-style-type: none"> • Game genre • Story/plot • Game world

	Auditory stimuli		<ul style="list-style-type: none"> • Game character
Narrative/Sensation	<ul style="list-style-type: none"> • Backstory • Plot • Storytelling 	Game environment	<ul style="list-style-type: none"> • Collaborative or competitive • Action or non-action
Interaction/Freedom	<ul style="list-style-type: none"> • Functionality • Interface Style • Navigation • Character Controls 	Game design style	<ul style="list-style-type: none"> • Activity types • Result management • Flexibility

Table 6. Comparison of themes and components from game model research and gender-game research

The comparison identifies some themes that have direct mapping between two research areas. For example, game play and game experience, aesthetics and game content have similar meanings. These two themes are reclassified to gameplay dimension and game content dimension. Game genre is classified to its own dimension because it is used as categorization of games. Other components and themes are analyzed based on their relevance to gender inclusivity.

Gender-neutral components include goal/objectives, fun/play, rules/patterns, balance, functionality, interface style, navigation and character controls. These components will be excluded. The remaining components relate to gender inclusivity. Let us further analyze these components.

Components from game model research	Components from gender-game research	Synthesis of themes including components
<p>Gameplay</p> <ul style="list-style-type: none"> • Challenge/Conflict • Feedback • Safety • Outcomes • Null • Null • Null • Null 	<p>Game experience/ Game environment/ Game design style</p> <ul style="list-style-type: none"> • Challenge/Conflict • Feedback/Learning • Risk-taking • Reward and penalty/Result management • Collaborative • Flexibility • Action/Competitive • Activity types 	<p>Gameplay</p> <ul style="list-style-type: none"> • Challenge/Conflict • Feedback • Safety • Result management • Collaboration • Flexibility • Competition • Activity types

Aesthetics/ Narrative/Sensation <ul style="list-style-type: none"> • Game world • Theme/Mystery/Plot/Storytelling • Visual stimuli and Auditory stimuli • Null 	Game content <ul style="list-style-type: none"> • Game world • Story/plot • Visual and auditory stimuli • Game character 	Game content <ul style="list-style-type: none"> • Game world • Storyline • Visual and auditory stimuli • Game character
<ul style="list-style-type: none"> • Null 	Game content <ul style="list-style-type: none"> • Game genre 	Game genre <ul style="list-style-type: none"> • Game genre

Table 7. Synthesis of themes and components from game model research and gender-game research

For simplicity and better representation, synthetic components will be reclassified further based on gender inclusivity. For example, visual stimuli and game world are combined into game graphics. Table 8 shows summary of reclassification for components and themes.

Themes	Synthesized components	New components
Gameplay	<ul style="list-style-type: none"> • Challenge/Conflict/Competition 	<ul style="list-style-type: none"> • Non violent action

	<ul style="list-style-type: none"> • Feedback 	<ul style="list-style-type: none"> • Feedback System
	<ul style="list-style-type: none"> • Safety 	<ul style="list-style-type: none"> • Support System
	<ul style="list-style-type: none"> • Result management 	<ul style="list-style-type: none"> • Reward and punishment System
	<ul style="list-style-type: none"> • Collaboration 	<ul style="list-style-type: none"> • Collaboration
	<ul style="list-style-type: none"> • Flexibility 	<ul style="list-style-type: none"> • Personalization
	<ul style="list-style-type: none"> • Activity types 	<ul style="list-style-type: none"> • Activity types
Game content	<ul style="list-style-type: none"> • Game world • Visual stimuli 	<ul style="list-style-type: none"> • Game graphics
	<ul style="list-style-type: none"> • Storyline 	<ul style="list-style-type: none"> • Storyline
	<ul style="list-style-type: none"> • Auditory stimuli 	<ul style="list-style-type: none"> • Sound/Music
	<ul style="list-style-type: none"> • Game character 	<ul style="list-style-type: none"> • Avatar
Game genre	<ul style="list-style-type: none"> • Game genre 	<ul style="list-style-type: none"> • Children/Education

Table 8. Summary of reclassification for components and themes

b. The proposed gender-inclusivity model

Based on the synthesized results, the proposed gender-inclusivity model helps to understand the makeup of gender inclusivity in games, measure the level of gender inclusivity in games and

guide the gender inclusivity game design process.

The first dimension is gameplay that describes the game behavior and how a player experiences the game. It has 7 components. The second dimension is game content that describes aesthetics elements of the game. It has 4 components. The last dimension is game genre that describes the type of the game. Educational games focus on children/education.

c. gender-inclusivity model components

I. Non-violent action

Non-violent action is characterized by little or no violence. This component describes the extent of non-violence action employed during competitive action, big challenge and conflict resolution.

II. Feedback System

Feedback is a part of every day life. It occurs when the output of something is put back in as input. Positive feedback occurs whenever something, good or bad, is amplified. Negative feedback occurs where something is dampened. Both positive and negative feedback are important in game design. Positive feedback, when done right, quickly separates player by their skills and strategies chosen. Negative feedback is also important. If you noticed that the computer players tend to perform better when you are winning, this is a typical example of negative feedback. When negative feedback is done right, the player does not really notice and the game remains engaging and competitive.

III. Support System

This component describes support features available to game player. Many games employ “trial and error” mechanism that forces players to make high-risk decisions that could result in harmful actions. A gender-inclusive educational game should provide enough information in the background story. And it also provides a guided tutorial for novice to practice their skills before starting the game. In-game instructions need to be easily accessible during playing by pop-up display on the screen or other ways.

IV. Reward and punishment System

“Reward and Punishment” is a good motivator, energizer and icebreaker. A gender-inclusive educational game should provide rewards for player while avoiding serious punishment by saving multiple versions of a scenario and showing game hints to improve gameplay. This encourages creativity with low risk and allows player to continue playing without the risk of harsh punishment.

V. Collaboration

This component describes collaborative choice during gameplay. A gender-inclusive educational game is expected to provide an option of collaboration with other players, such as instant message, chat room, a game community.

VI. Personalization

This component describes the degree of personalization in game. A gender-inclusive educational game should provide personalization of game speed and difficulty level. A player can choose different game modes according to this player’s skill and experience.

VII. Activity types

This component describes the extent of how diverse game activity. A gender-inclusive educational game should provide a wide range of game activities. A player has several paths to complete a mission. For example, crossing a river can be in several ways, such as swimming, crossing a bridge, boating, floating.

VIII. Game graphics

This component describes the type of graphics. The game should present a wide range of graphics and scenes.

IX. Storyline

This component describes the extent of which storyline is interwoven into a game. . A gender-inclusive educational game is meaningful, educational and adaptable. A storyline develops through plot twists, e.g. finding rare ingredients for a recipe.

X. Sound/Music

This component describes the extent of sound/music customization. A gender-inclusive educational game should provide personalization of sound/music.

XI. Avatar

This component describes the extent of avatar representation customization. A gender-inclusive educational game should provide avatar personalization, appearance and behavior. Avatar personalization involves gender selection and features to modify a player's avatar. A gender-inclusive game should provide an equal number of male and female characters for

selection and character modification features, e.g. facial feature, name, clothing, personality and roles. Avatar appearance relates to character clothing and physical appearance. A gender-inclusive game should present a positive representation of avatar by offering a wide range of clothing and provide a wide range of physical appearance, e.g. tall, lean, muscular and athletic. Avatar behavior relates to an avatar's role and personality trait. A gender-inclusive game should provide a wide range of roles for male and female, e.g. mentor, leader and heroes, and a wide range of personality traits, e.g. females are portrayed as strong, adventurous and assertive while males are portrayed as peaceful, cheerful and empathic.

Summary and future work

The integrated model of gender aspects in educational computer games supports gender inclusivity in games and helps to understand the makeup of gender inclusivity in games, define gender inclusivity in games and measure the level of gender inclusivity in games. More importantly, the model could become a guide for designing a more gender inclusive educational games.

After providing the integrated model, the application and validation of the model to education field is needed. The next steps also involve identifying issues regarding the model components and finding ways for the model to be widely used and accepted.

References:

1. Kafai, Y. B. (1998). *Video game designed by girls and boys: Variability and consistency of gender differences*. In J. Cassell & H. Jenkins (Eds.), *From Barbie to Mortal Kombat: Gender and computer games* (00. 90-114). Cambridge, MA: MIT Press.

2. Laurel, B. (2001). *Utopian Entrepreneur*. MIT Press, Cambridge
3. Connolly, T. M., E. A. Boyle, E. MacArthur, T. Hainey, and J. M. Boyle. (2012). *A systematic Literature Review of Empirical Evidence on Computer Games and Serious Games* Computers & Education 59 (2): 661– 686
4. Lynn, M. R. (1986). *Determination and quantification of content validity*. Nursing Research, 35(6), 382-385.
5. Harter, S. (1981). *A New Self-report Scale of Intrinsic versus Extrinsic Motivation in the Classroom: Motivational and Informational Components*. Development Psychology, 17, 300-312
6. Gailey, C. (1992). *Mediated Messages: Gender, Class and Cosmos in Home Video Games*. Journal of Popular Culture, 15 (2), 5-25
7. Herz, J. C. (1997). *Joystick nation: How videogames ate our quarters, won our hearts, and rewired our minds*. Boston: Little Brown.
8. Crawford, C. (1982). *The Art of Computer Game Design*. Journal. Retrieved from <http://library.vancouver.wsu.edu/sites/library.vancouver.wsu.edu/files/ACGD.pdf>
9. Costikyan, G. (1994). *I Have No Words and I Must Design*. Journal, (In Interactive Fantasy #2). Retrieved from <http://www.costik.com/nowords.html>
10. Hunicke, R., LeBlanc, M., & Zubek, R. (2001). *MDA: A Formal Approach to Game Design and Game Research*. Paper presented at the Game Design and Tuning Workshop. from <http://www.cs.northwestern.edu/~hunicke/MDA.pdf>
11. Kreimeier, B. (2002). *The Case for Game Design Patterns*. Journal. Retrieved from http://www.gamasutra.com/features/20020313/kreimeier_pfv.htm

-
12. R. Garris, R. Ahlers, and J. E. Driskell. (2002) *Games, motivation, and learning: a research and practice model* Simulation & Gaming, vol. 33, no. 4, pp. 441–467.
 13. Rollings, A., & Adams, E. (2003). *Andrew Rollings and Ernest Adams on Game Design* (1 ed.). US: New Riders Publishing.
 14. Fullerton, T., Swain, C., & Hoffman, S. (2004). *Game Design Workshop: Designing, Prototyping and Playtesting Games*. Lawrence, KS: CMP Books.
 15. Salen, K., & Zimmerman, E. (2005). *Game Design and Meaningful Play*. In J. Raessens & J. Goldstein (Eds.), *Handbook of Computer Game Studies* (pp. 70-75). Cambridge: MIT Press.
 16. P. Sweetser and P. Wyeth. (2005) *GameFlow: a model for evaluating player enjoyment in games* ACM Computers in Entertainment, vol. 3, no. 3, pp. 1–24.
 17. Koster, R. (2005). *A Theory of Fun for Game Design*. Scottsdale, Arizona: Paraglyph Press.
 18. Jarvinen, A. (2007). *Introducing Applied Ludology: Hands-on Methods for Game Studies*. Paper presented at the Situated Play, DiGRA 2007 Conference.
 19. J. H. Kim. (2008) “The Threefold Model,”
<http://www.darkshire.net/~jhkim/rpg/theory/threefold>.
 20. Urie, Bronfenbrenner. (1960) *Child Development*. Child Development Vol.31, No. 1, pp. 14-30
 21. Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.

-
22. Sandra, Lipsitz Berm .(1983) *Gender Schema Theory and Its Implications for Child Development: Raising Gender-Aschematic Children in a Gender-Schematic Society* Signs Vol.8, No. 4, pp. 598-616.
23. Kohlberg, Lawrence. (1966). *A cognitive-developmental analysis of children's sex- role concepts and attitudes*. In E. E. Maccody (Ed.), *The development of sex differences*. Stanford, CA: Stanford University Press.
24. Jae, Curtis. (2012) *Guys and Dolls: Reducing gender stereotypes in your home*
25. Lewis, M. (1998). *Sugar, Spice and Everything Nice: Computer Games Girls Play*. Journal. Retrieved from <http://www.slate.com/id/2713/>
26. Harris, C. R., Jenkins, M., & Glaser, D. (2006). Gender Differences in Risk Assessment: *Why do Women Take Fewer Risks than Men? Judgment and Decision Making*, 1(1), 48-63.
27. Kafai, Y. B. (1998). Video Game Designs by Girls and Boys: *Variability and Consistency of Gender Differences*. In J. Cassell & H. Jenkins (Eds.), *From Barbie to Mortal Kombat: Gender and Computer Games* (pp. 90-117). Cambridge, MA: MIT Press.
28. Flanagan, M. (2005, June 16th - 20th). Troubling 'Games for Girls': *Notes from the Edge of Game Design*. Paper presented at the DiGRA 2005 Conference: *Changing Views--Worlds in Play*.
29. Weber, E. U., Blais, A.-R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: *measuring risk perceptions and risk behaviors. Journal of Behavioral Decision Making*, 15(4), 263-290.

-
30. Bryce, J., & Rutter, J. (2005). *Gendered Gaming in Gendered Space*. In J. Raessens & J. H. Goldstein (Eds.), *Handbook of Computer Games Studies* (pp. 301-310). Cambridge, MA: MIT Press.