



**PRESENTASJON AV**

**CODIFYING GAME-BASED LEARNING: THE  
LEAGUE FRAMEWORK FOR EVALUATION**

# Introduksjon

- Hva er spillbasert læring?
- Hvilke utfordringer har eksisterende evalueringsslitteratur?
- Forskjellige studier rundt Pedagogiske spill.
- Systematisk kategorisere GBL-evalueringselementer når det gjelder omfang, definisjon og bruk.
- Rettet innholdsanalyse av GBL-evalueringsslitteratur.
- Løsning: Leauge.



# Konsept og eksisterende rammeverk for spillbasert læring

- Læring
- Flyt "flow"
- Spill design
- Brukervennlighet
- Pedagogikk i spill design

# Metode

- “Directed Content Analysis” på 58 GBL evalueringer i litteraturen.
- Henter ut og strukturerer data elementer som:
  - Dimensjoner
  - Faktorer
  - Subfaktorer
  - Parametere
  - Sammenkoblete dimensjoner, faktorer og subfaktorer.
  - Definisjoner av dimensjoner, faktorer og subfaktorer.



# "The LEAGUE framework"

- **L**earning
- **E**nvironment
- **A**ffective-cognitive reactions
- **G**ame factors
- **U**sability
- **U**sEr

# Definisjon av terminologi og konsept

- Dimensjon: isolerte og vide konsepter som representerer hovedelementene av GBL (f.eks. Learning, Evaluation).
- Faktor: grunnleggende elementer som er viktig for å oppnå en. dimensjon i GBL
- Subfaktor: et videre spesifisert element av en faktor.
- Metrikk/Parameter: objektiv eller subjektiv data som er et mål på hvorvidt en faktor/subfaktor oppnås (f.eks. spilletid).

# Dimensjoner

- Læring
- Omgivelser
- Affektiv-kognitiv reaksjon
- Spill faktorer
- Brukervennlighet
- Brukeren

<b>Learning/Pedagogical</b>	
Characteristics of an educational game that promote and facilitate learning.	(De Freitas and Oliver 2006; Yoon and Park 2013; Rêgo and de Medeiros 2015; Pappa and Pannese 2010; Omar and Jaafar 2010)
<b>Game Factors</b>	
Elements and features of a game environment (the game world) of an educational game that stimulate the users.	(Oprins, Visschedijk et al. 2015; Yue and Zin 2009; De Freitas and Oliver 2006; Yoon and Park 2013; Aleven, Myers et al. 2010; Zaibon and Shiratuddin 2010; Tan, Ling et al. 2007; Rooney 2012; Djelil, Sanchez et al. 2014; Liao and Shen 2012)
<b>Affective Cognitive Reactions (ACR)</b>	
Set of emotions, attitudes and feelings triggered by educational game.	(Rêgo and de Medeiros 2015; Zhang, Fan et al. 2010; Rooney 2012; Djelil, Sanchez et al. 2014; Annetta 2010; Pourabdollahian, Taisch et al. 2012)
<b>Usability</b>	
The extent to which an educational game is usable by the learners to accomplish specific goals (including how to learn, understand, control, and user satisfaction).	(Yue and Zin 2009; Rêgo and de Medeiros 2015; Zaibon and Shiratuddin 2010; Djelil, Sanchez et al. 2014)
<b>User</b>	
Characteristics of the target users/user group of an educational game to investigate if the game matches the intended users.	(Tan, Ling et al. 2007; De Freitas and Oliver 2006; Oprins, Visschedijk et al. 2015; Tan, Ling et al. 2007; Djelil, Sanchez et al. 2014)
<b>Environment</b>	
Conditions for practical use of GBL and accessibility of educational game in terms of its environment	(Zaibon and Shiratuddin 2010; Djelil, Sanchez et al. 2014; Pappa and Pannese 2010)

Figure 1. Dimensions in the LEAGUE framework



# Faktorer og sub-faktorer

<b>Learning Objective:</b> Goals and purpose for transfer of knowledge and skills by educational games to users.	(Law and Sun 2012; Alfadhli and Alsumait 2015; Aleven, Myers et al. 2010; Marciano, Miranda et al. 2014)
<b>Learning Strategies:</b> Pedagogical theories, learning models and approaches to achieve learning objectives.	(De Freitas and Oliver 2006; Alfadhli and Alsumait 2015; El-Sattar and Hussein 2016)
<b>Learning Content:</b> Educational material (facts, data and information) provided used for learning in educational games.	(Marciano, Miranda et al. 2014; Alfadhli and Alsumait 2015)
<b>Learning Outcome:</b> Desired learning output (student achievements) from educational games.	(Alfadhli and Alsumait 2015; Wang, Liu et al. 2015; Oprins, Visschedijk et al. 2015)
<b>Game Definition:</b> Game goals depending on appropriate set of game rules defining the gaming tasks in games.	(Fu, Su et al. 2009; Oprins, Visschedijk et al. 2015; Djellil, Sanchez et al. 2014)
<b>Game Narrative:</b> Describes what happens in the virtual world including character development and plot.	(Omar and Jaafar 2010; Shi and Shih 2015; Mitgutsch and Alvarado 2012)
<b>Game Mechanics:</b> Defines the functioning, operation and interaction with the game world.	(Yue and Zin 2009; Omar and Jaafar 2010; Mitgutsch and Alvarado 2012; Shi and Shih 2015)
<b>Game Resources:</b> All resources provided to the player (should have both utility and scarcity).	(Alfadhli and Alsumait 2015; Wallner and Kriglstein 2011; Tan, Ling et al. 2007)
<b>Game Aesthetics:</b> Audio-visual language selected, conceptualized and used (images, text, audio, video, animation and multimedia).	(Mitgutsch and Alvarado 2012; Omar and Jaafar 2010)
<b>Game Play:</b> Process by which user reaches the goal which defines the set of challenges the user face to win the game.	(Omar and Jaafar 2010)
<b>Flow:</b> State of absolute absorption in an activity which represents an optimal experience.	(Kiili, Lainema et al. 2014; Su, Chen et al. 2013; Fu, Su et al. 2009)
<b>Motivation:</b> Level of user involvement in participating and using an educational game by devoting additional time and effort.	(Djellil, Sanchez et al. 2014; Oprins, Visschedijk et al. 2015)
<b>Engagement:</b> User activity absorption and interest in activity or task, and users' subjective acceptance of games reality combined with degree of focus on this realism.	(Oprins, Visschedijk et al. 2015)
<b>Enjoyment:</b> The extent of playing the educational game is considered pleasurable for an individual user.	(Giannakos 2013)
<b>Interface:</b> Component through which users interact with a game (elements utilized by user to interact with the educational game that influences its usability).	(Yue and Zin 2009; Omar and Jaafar 2010)
<b>Learnability:</b> Capability of an educational game to enable the user to easily learn to use specific functions.	(Yoon and Park 2013; Tseloudi and Tsiatsos 2015)
<b>Satisfaction:</b> Comfort and acceptability of an educational game to its users.	(Yoon and Park 2013; Tseloudi and Tsiatsos 2015; Ibrahim and Jaafar 2009)
<b>Learner Profile:</b> Attributes of a particular learner/ group.	(De Freitas and Oliver 2006; Djellil, Sanchez et al. 2014)
<b>Cognitive Development:</b> Games should suit learners' cognitive development level.	(Tan, Ling et al. 2007)
<b>Psychological Needs:</b> Games should suit users' psychological needs.	(Tan, Ling et al. 2007)
<b>Technical:</b> The accessibility and easiness of a user to enter the game world with the used technology and specified technical criteria.	(Zaibon and Shiratuddin 2010; Pappa and Pannese 2010)
<b>Context:</b> The particular context where GBL will take place using the educational game.	(De Freitas and Oliver 2006; Perttala, Kiili et al. 2017)

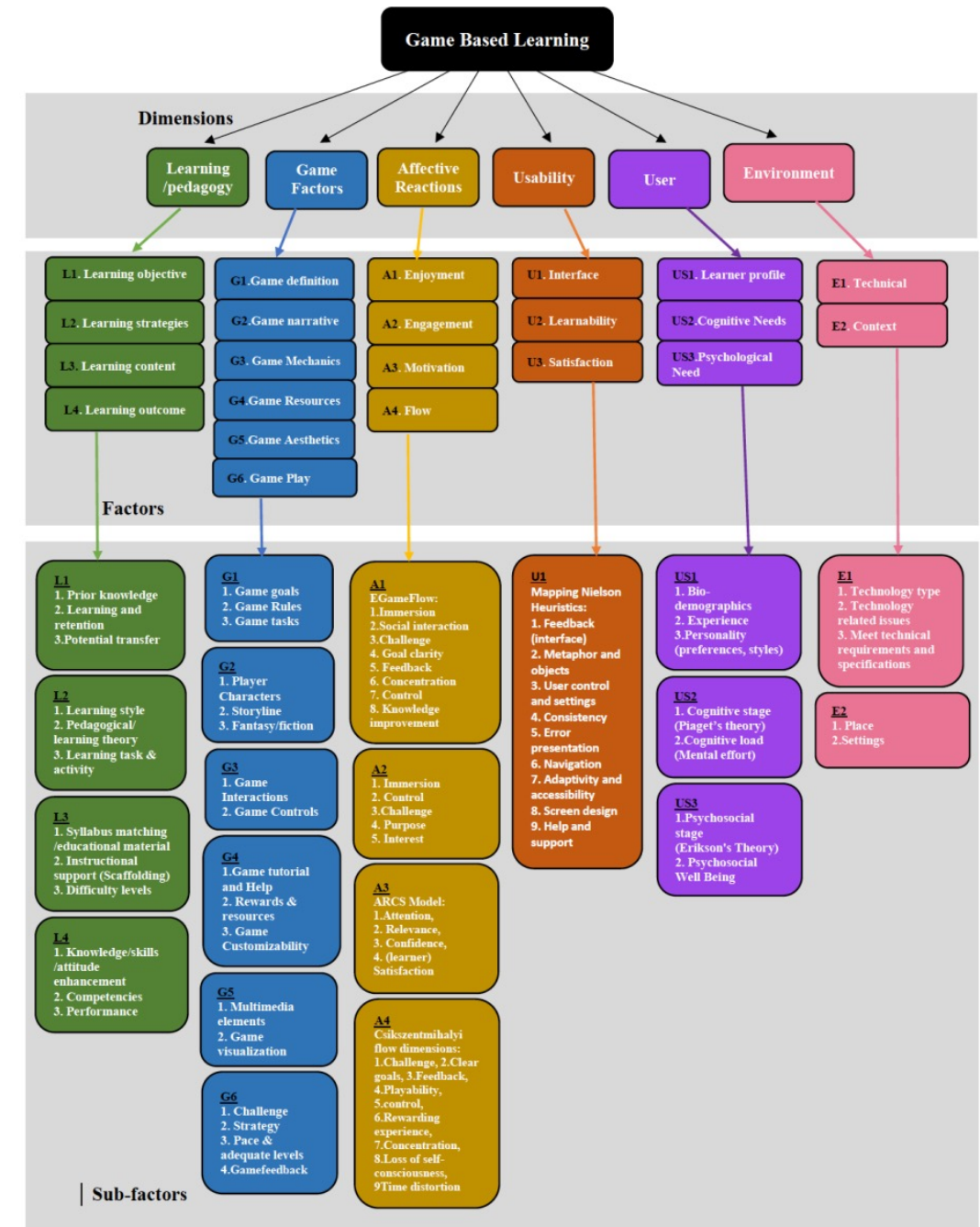


Figure 2: LEAGUE hierarchal structure and components



# Hensikt med rammeverket LEAGUE

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# Metrikk

- Mål på oppfyllelse av (sub)faktorer  
F.eks. spilletid  $\Leftrightarrow$  innlevelse
- 83 forskjellige målinger, inndelt i 5 typer
- Subjektiv og objektiv metrikk

Metrics	Examples
Scores	pre/post test score (Petri and von Wangenheim 2017), game performance/score, retention score (Wang, Liu et al. 2015) etc.
Time	Game session time (Rêgo and de Medeiros 2015), learning time, task completion time (Connolly, Stansfield et al. 2009), Time spent on each problem (Eagle 2009) etc.
Number of occurrences	No of usability problems, no of navigation problem (Virvou and Katsionis 2008), no of failures (Yoon and Park 2013), no of levels played(Connolly, Stansfield et al. 2009), no of overall attempts (Wallner and Kriglstein 2011), no of distraction occurrences (Virvou and Katsionis 2008) etc.
Rating	3,4,5,6,7point Likert scale ((Kiili, Lainema et al. 2014;Shiratuddin and Zaibon 2011;Fu, Su et al. 2009; Zaibon and Shiratuddin 2010; Yu, Hsiao et al. 2005)), severity ratings (Mohamed, Yusoff et al. 2012), User task ranking (Connolly, Stansfield et al. 2009)etc.
Reviews/responses /opinions	expert review (Connolly, Stansfield et al. 2009), self-assessment (Bellotti, Kapralos et al. 2013), Mood and attitude statements (Connolly, Stansfield et al. 2009), game review based on selected (sub)factors (De Freitas and Oliver 2006), comments on positive/negative game aspects(Wang, Liu et al. 2015) etc.

Figure 5. Examples of the Metrics

# Relasjoner

- Dimensjonene kan enten ses på i isolasjon, eller som et system av årsak og virkning mellom dimensjonene
- Menneske- og teknologisentrale dimensjoner
  - Teknologi hever menneskesentrale dimensjonene

Dimensions	Relation	References
<b>Learning &amp; Game Factors</b>	Integration/ Balance	(De Freitas and Oliver 2006; Alevan, Myers et al. 2010; Zhang, Fan et al. 2010; Wallner and Kriglstein 2011; El-Sattar and Hussein 2016; Pappa and Pannese 2010)
<b>ACR &amp; Learning</b>	Positive effect	(Kiili, Lainema et al. 2014; Thomas, Schott et al. 2004; Oprins, Visschedijk et al. 2015); Perttula, Kiili et al. 2017; Bellotti, Kapralos et al. 2013; Yu, Fu et al. 2009; Tseloudi and Tsiatsos 2015; Giannakos 2013)
<b>Game Factors &amp; ACR</b>	Generate	(Rooney 2012; Abdul Jabbar and Felicia 2015; Ronimus, Kujala et al. 2014)
<b>(Integration of Game Factors and Learning) &amp; ACR</b>	Enhance/facilitate /increase	(Kiili 2005; Zhang, Fan et al. 2010; Rooney 2012)
<b>Usability &amp; (Learning, Game factors, ACR)</b>	Influence	(Gibson and Bell 2013; Shi and Shih 2015)
<b>User &amp; (Learning, Game factors, ACR)</b>	Influence	(De Freitas and Oliver 2006; Abdul Jabbar and Felicia 2015; Mei, Ku et al. 2015; Yu, Hsiao et al. 2005; Mitgutsch and Alvarado 2012; Shi and Shih 2015)
<b>Environment &amp; (Learning, Game factors, ACR)</b>	Influence	(De Freitas and Oliver 2006; Oprins, Visschedijk et al. 2015; Dondi and Moretti 2007; Virvou and Katsionis 2008)
<b>Usability &amp; Environment</b>	Address/Cater	(Virvou and Katsionis 2008)
<b>Usability &amp; User</b>	Address/ Cater	(Virvou and Katsionis 2008; Mei, Ku et al. 2015)
<b>User &amp; Environment</b>	Map	(De Freitas and Oliver 2006)

Figure 6: Relations in LEAGUE

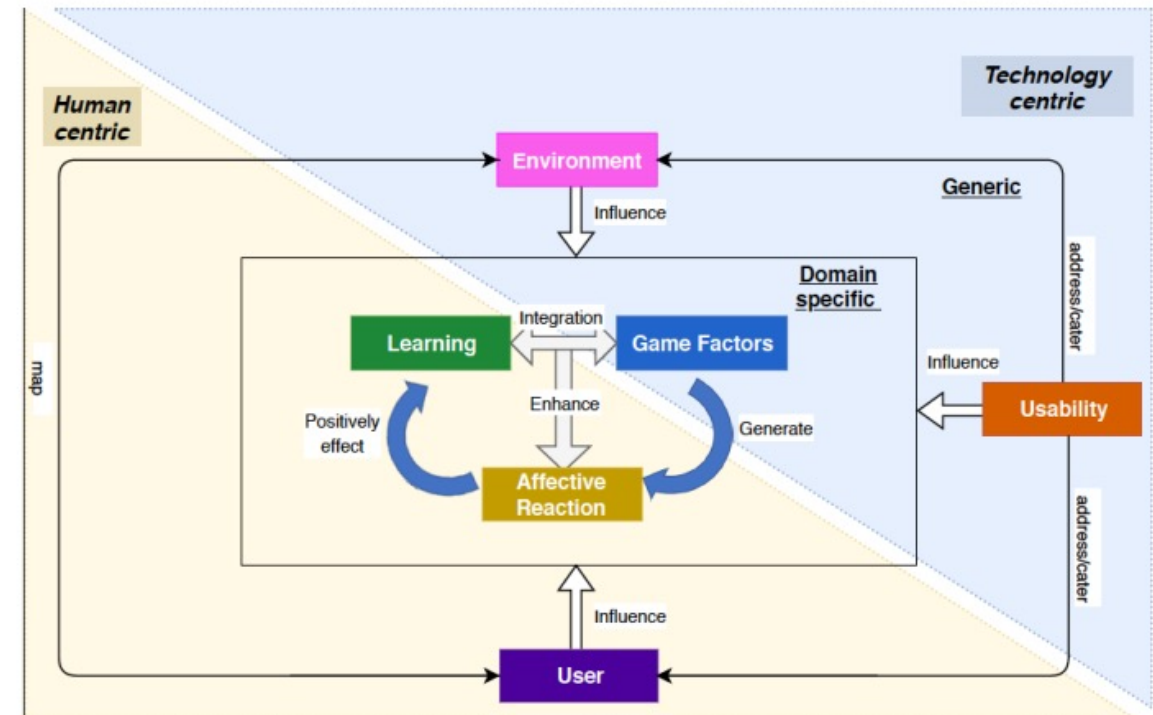


Figure 7 High level abstraction of LEAGUE

# Diskusjon og konklusjon

- Overkomme svakheter i nåværende litteratur
  - LEAGUE, multidimensjonal rammeverk basert på eksisterende forskning
  - Nyttig for flere: forskning, design og utvikling
  - Nyttig i flere stadier: planlegging, design og analyse
  - Ikke begrenset til sjanger
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- Videre forskning: delvis automatisere GBL evaluering