

# Strategy

## Information Literacy Game-based model



By **ERASMUS+** *Project NAVIGATE – Information Literacy: A Game-based Learning Approach for Avoiding Fake Content*

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# Purpose and goals for the strategy

As a documented learning base and IL-strategy for operationalize O3, halfway through the project period. Also, as "lesson learned " and a form of "Mid-term internal review" for others to take part in project planning or project monitoring for similar EU projects or internal projects to create a learning experience around information and or digital Competences.

- Input - as for reflection in a structured way - for the further planning and implementation of IL game-based models in this project (mainly O3)
- As a basis for better understanding of the role for integration of the Navigate games in the syllabus in to the BA curricula and other learning situations
- Elaborating on some possible learning situations and learning activities with the games
- Proposal and strategy for choose relevant areas of content - as learning modules in the game - and skills from the Competency tree Framework and the design of the games blueprint (game mission, structure of the game, assessment type/model)
- Thinkable interaction and assessment models of the IL-games
- Metadata and technical issues / specifications to consider in O3 (usability, prototype, testing, learning analytics<sup>1</sup> et cetera)

## Lesson learned from the NAVIGATE project

### Output 1

The questionnaire (web survey) for students in the humanities was conducted according to plan. A lower response rate than expected occurred. Most of the questions stemmed from the previous successful study. The addition of questions concerning primarily digital competences was made.

Compilation and comparison of the different countries ' results were made. The results were presented in report compilations and in Conference reports.

From the analysis work with the results from the work on the survey, analysis and selection of IL-frameworks and frame works regarding digital competencies (SCONUL, EUROPASS etc.), an interactive framework was created - called the Competency tree Framework.

The [Justframework.com](https://justframework.com) tool was used to visually divide the competencies that the students had the most flaws (failings and faults) around.

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<sup>1</sup> URL: [https://teachonline.ca/sites/default/files/tools-trends/downloads/ten\\_facts\\_about\\_learning\\_analytics.pdf](https://teachonline.ca/sites/default/files/tools-trends/downloads/ten_facts_about_learning_analytics.pdf)



Figure 1: Competency tree<sup>2</sup> - interactive web tool via Justframework.com

The Competence Tree for develop a game-based model for Information Literacy training involving a plan for progression for working module for specific game tasks and game-based activities. EU-project NAVIGATE (navigame.eu). No: NAVIGATE 2017-1-BG01-KA203-036383 Erasmus+. The Subject area is Personal skills & development, digital competencies regarding fake content and information literacy for humanist academic BA-students - especially for and regarding scientific research and scientific writing - to avoiding fake content.

We used an open licence for Copyright - Information Literacy and avoid fake content Competency tree - Framework is licensed under a Creative Commons Attribution 4.0 International License - <http://creativecommons.org/licenses/by/4.0/>

For the framework - Identify, evaluate and avoid fake information: Added the perspective for "Relevance?" of critical thinking from: A Super-Streamlined Conception of Critical Thinking Robert H. Ennis, 6/20/02. For the framework - Identify and scope - search/find information: SCONUL Information Literacy - understand or is able to do: Able to identify a personal need for information and can assess current knowledge and identify gaps. Inspired also by: The Information Literacy User's Guide: An Open, Online Textbook by ©2014 Deborah Bernard, Greg Bobish, Jenna Hecker, Irina Holden, Allison Hosier, Trudi Jacobson, Tor Loney, and Daryl Bullis. For the framework - Digital competence - regarding fake content: Digital Competences - EUROPASS and DigiComp (year 2016) DigiComp 2.1 (year 2017) as digital citizenship Digitalcompass.org. Extended with academic tools for organizing knowledge. Reduced knowledge about basic programming language, health risks and environmental issues. Added: Disclose fake content - safety rules of surfing.

<sup>2</sup> URL: <https://www.justframeworks.com/#!/frameworks/1a37b1af-a89b-e811-80c2-000d3ab29ba4>

## Lesson learned from the survey and competency tree

Take-off point:

*“There is a lot of learning from those who have succeeded well in other projects, but the conditions of our project partners are too different for all partners to be able to do the same.”*

In the article “SIX Frames for Information literacy Education: a conceptual framework for interpreting the relationship between theory and practice”<sup>3</sup> (Bruce et al, 2006), the authors elaborate on variation in ways of seeing teaching and learning regarding information literacy differently.

The present Six Frames for Information Literacy Education as following:

1. The Content Frame
2. The Competency Frame
3. The Learning to Learn Frame
4. The Personal Relevance Frame
5. The Social Impact Frame and
6. The Relational Frame

Here each frame brings a particular view of IL, information, curriculum focus, learning and teaching, content and assessment. From the frames some good questions for our project can be drawn:

In the CONTENT FRAME the Curriculum focus is - *What should learners know about the subject about IL? And View of Content is about - What needs to be known has primacy. All relevant content must be covered*

In the COMPETENCY FRAME the Curriculum focus is - *What should learners be able to do? And View of Content is about - Content is derived from observation of skillful practioners*

In the LEARNING TO LEARN FRAME the Curriculum focus is - *What does it mean to think an (IL) professional in the relevant field? And View of Content is about Content is chosen for mastering important concepts and fostering reflective practice*

In the PERSONAL RELEVANCE FRAME the Curriculum focus is - *What good is IL to me? (the learner) And View of Content is about Problems cases, scenarios selected to reveal relevance and meaning*

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<sup>3</sup> URL:

[https://www.researchgate.net/publication/26467429\\_Six\\_Frames\\_for\\_Information\\_literacy\\_Education\\_a\\_conceptual\\_framework\\_for\\_interpreting\\_the\\_relationships\\_between\\_theory\\_and\\_practice](https://www.researchgate.net/publication/26467429_Six_Frames_for_Information_literacy_Education_a_conceptual_framework_for_interpreting_the_relationships_between_theory_and_practice)

In the SOCIAL IMPACT FRAME the Curriculum focus is - *How does IL impact society?* And View of Content is about *Reveals how IL can inform widespread or important social issues or problems*

In the RELATIONAL FRAME the Curriculum focus is - *Bringing about awareness of the critical ways of seeing or experiencing* And View of Content is about *Examples selected to help student discover new ways of seeing. Critical phenomena for learning must be identified*

Implementing the relational frame, the authors include the following:

- Knowledge about the world of information (CONTENT FRAME)
- A set of competencies or skills (COMPETENCY FRAME)
- A way of learning (LEARNING TO LEARN)
- Contextual and situated social practices (PERSONAL RELEVANCE FRAME)
- Power relationships in society and social responsibility (SOCIAL IMPACT FRAME)

Limited vs Complex ways of experiencing evidence & argument for student working with assignments (in this context the games activities - example regarding fake content) to analysis of various forms of information, is presented in a table - addressing the problem as in following example:

Limited	Complex
I need to search for contrasting perspective provide balance for my argument	I need to search for contrasting perspectives to understand the big picture
The essay argument is my personal viewpoint	I need to understand the issues in order to <i>develop</i> an argument. My personal viewpoint is included in my argument but it is not the same as my argument.
My argument / viewpoint stays the same	I rethink my argument as I find more information
I restrict my searching and reading as I already know what I want to say.	I need to read extensively in order to create and develop an argument. I continuously search for information.

Table 1: Limited or/and Complex context

The article has an appendix (for this project useful and applicable) with an overview over the Six Frames for information literacy Education, Jan 2006 - page 18.<sup>4</sup>

<sup>4</sup> URL: <https://core.ac.uk/download/pdf/143879333.pdf>

## Strategic education - output 1

### To summarize ....

The Web survey received results that could also be handled comparatively.

SCONUL and EUROPASS worked as basis both for the survey and for the analysis of the web survey results and to create a relevant IL- and framework regarding digital competencies for humanist BA-students.

The Competency Tree Framework was done with a generic Framework web tool - ready for all to use and modify with an open OER license model.

The Competency Tree Framework have possibilities to be used both as a basis for game development as well as for direct teaching about the necessary information skills and digital skills for humanities students, here also taking into account integrating learning modules from Competency Tree Framework within the Liberian's progression plans for the curriculum in a course or education program.

Lesson learned is that it affects students to have clear arguments for their perception around what is false data, false content or fake news here is the tool around Limited vs Complex ways of experiencing evidence & arguments. This is important to take care of in the learning modules in the learning design of the game.

Questions from the article "SIX Frames for Information literacy Education: a conceptual framework for interpreting the relationship between theory and practice" is relevant and can be used as critical question in the work with the learning design for game production and using the Competency Tree Framework with the students.

# Lesson learned from the NAVIGATE project

## Output 2

Output 2 was the work and results of Systematization of existing digital IL Games and examples of integration of the skills from the competency tree into existing or new progression plans regarding information literacy educational input in the course curricula.

In Output A1 of the project we did some sharp examples of how-to integration of Navigate syllabus into the BA curricula<sup>5</sup>. We revised some progression plans and curricula and did some new university humanities curriculum with new parts (from the competency tree) embedded by librarians and did user cases<sup>6</sup> as example for integrate the games and the competency tree, for several educational situation.

In the process of systematizing existing games around information literacy and false content, 20 “best” games of 67 that were inventoried over the Internet were searched and prioritized. This was a collaborative work through the Google Sheet tool.

The games were ranked (1 to 10 points) according to the following quality criteria:

- Content (regarding to the skills/learning outcomes in the competency tree)
- Activities (relevance)
- Assessment (related to existed outcome)

The categorization of each game was done through the framework created through the competence tree and the following selection of technical specifications (ranking from 1-10 points):

Requirements	Genre	Modality	Playability	Lastability	Engagement	UI	Storytelling
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The categorization of the games also had this metadata with comments in the Google Sheet:

- Producer and year
- Genre
- Multilanguage (Yes/No)
- Modality/Game Play (Single Player or Multi Player)
- Platform / Operating System
- Cost Type (Open / Commercial)
- Learning Curve / Difficulty (Low, Medium, High)
- Assessment/Reporting Tool (No / Quantitative / Qualitative)

Creation of the Interactive database was done, for visualize a shortlist of good examples 20 games with higher quality regarding learning information literacy and game-based learning.

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<sup>5</sup> URL: [https://drive.google.com/drive/folders/1tHjg\\_MVthPUV8gS0RRhC2gwJfbvEe9Zp](https://drive.google.com/drive/folders/1tHjg_MVthPUV8gS0RRhC2gwJfbvEe9Zp)

<sup>6</sup> URL: [https://drive.google.com/drive/folders/1tHjg\\_MVthPUV8gS0RRhC2gwJfbvEe9Zp](https://drive.google.com/drive/folders/1tHjg_MVthPUV8gS0RRhC2gwJfbvEe9Zp)



## Lesson learned from the analysis and systematization of existing digital IL games

### O2 A3 Systematization of existing digital IL Games - NAVIGATE have the opportunity to fill the “market-gap”

From the matrix with categories of competences from regarding the Framework from Outcome 1 of the project - we note that from analysis from 67 games on the market and at university and K12-level the totals of content categories as following:

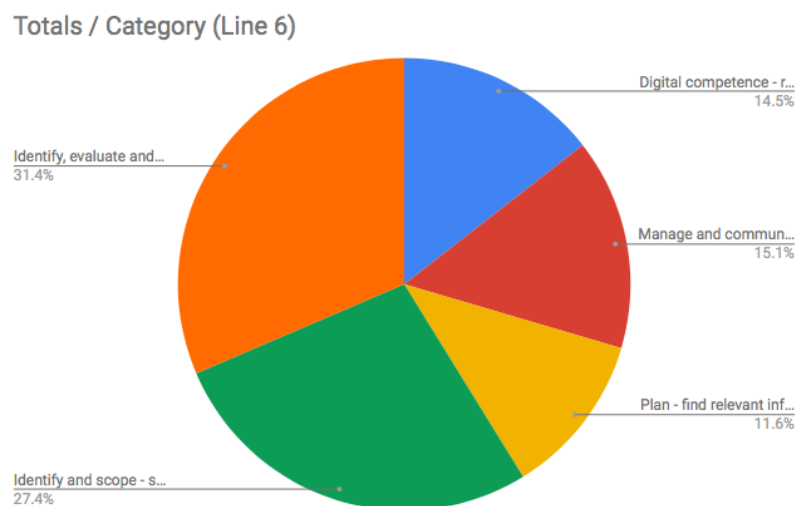


Figure 2. Totals / Categories in 67 games in the A3 Systematization of existing digital IL-games

From this we note that some areas of competences, there is not relevant and new games produced within the last year for university levels. Mostly there is where old games regarding references, academic akribia etc. And the new games mostly take care of only aspect of handling fake news.

The games produced within NAVIGATE have the opportunity to fill the “market-gap”. Our strategy here is to see what is the opening for our games in the field of current serious games around information literacy, digital competences and fake content.

Overview of “market” regarding games all of the 67 games, around information literacy, digital competences and fake news/content - A3 Systematization of existing digital IL-games:

<b>Competences - Matrix (regarding the content areas)</b>	<b>Old games - is mostly produced by University and library units</b>	<b>Newer games produced by a foundation, game specialists, media and journalist agency/university.</b>
Digital competence - regarding fake content	Yes	No
Manage and communicate information	Yes	No
Plan - find relevant information	Yes	No
Identify and scope - search/find information	Yes	No
Identify, evaluate and avoid fake information	No	Yes

Table 2: Matrix - content areas in old and newer games. A summary.

**Summary:**

**Digital competence - regarding fake content** - mostly very old or very new games

**Manage and communicate information** - mostly very old and the games not working good

**Plan - find relevant information** - many old games now, not very well working today

**Identify and scope - search/find information** - many old games, now very well working today

**Identify, evaluate and avoid fake information** - several new games and working well today

**Conclusion and recommendation - general analysis of all 67 games:**

Their several new games about fake news and how to learn about that. They responsive and workable in with mobile devices. But some of them are advanced and you have to work with a PC and the content include a lot of video scenario etc. The old games are mostly not responsive and often in the old Flash-format - have relevant competencies for our project but not in rely on gamification (such we define it today).

This project can therefore fill the gap and have the potential to deliver all or part of the content areas - se summary above.

## O2 A3 Visual Analysis - Systematization of the best 20 existing digital IL Games - NAVIGATE have the opportunity to fill the “market-gap”

Here is a walkthrough with a detailed visual analysis of the various competencies on the market covering up - via games analyzed. It shows only the top 20 games, which were also assessed through content, activity and assessment. Here, too, some areas of competences are missing in whole or in part - therefore the project in O3 should reasonably focus on the availability of games that are not on the market or in whole or in part missing in any game analyzed by the project and systematized.

The visual analysis show results from what we gain as gap analysis form the systematizing current 20 games. Was is lacking in these 20 games we have the possibility and can partly include in our games or not.

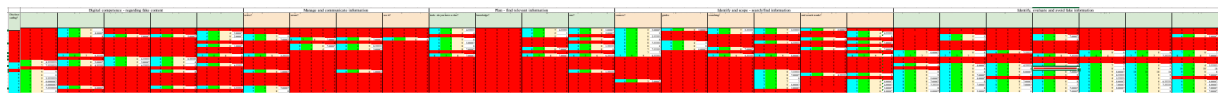


Table 3: Visual overview - red indicate games that not fulfilled with content related to the Competency tree Framework

The picture above provides an overview of what games contain the critical skills and competencies found in Competency tree Framework.

The older games have a total of low overall points in the joint scoring assessment.

### Identify, evaluate and avoid fake information

The newer games have an overweight with content, activities and assessment in the field of Identify, evaluate and avoid fake information. Few or none of the old games do not meet this content area.

As an example, the game Bad New game is already translated into Swedish (badnewsgames.se), in a project together with the organization *Freezer House* - a non-profit organization independent together with Uppsala University and with the Netherlands and researchers at Cambridge.

The Swedish researchers at Uppsala University will also translate the e-service <http://nyhetsvarderaren.se> to become an independent platform that will be disseminated internationally. The *News Evaluator* is a collaboration between science & Public, Uppsala University and RISE Research Institutes of Sweden. The project is funded by Vinnova and Uppsala University.





### Summary - visual analysis (20 best games)

Overview and proposal of chose areas from the competency tree framework - from the games in the “market”, regarding the best 20 games (of all of the 67 games inventory), around information literacy, digital competences and fake news/content - A3

Systematization of existing digital IL-games:

Competences - Matrix (regarding the content, activities and assessment areas)	Possible areas for the NAVIGAME game/s to develop - give priority to	Areas of local complementary focus - here the instructor, librarian can add adapted and customized contextual input by them self
Digital competence - regarding fake content	“Disclose fake content - my safety rules of surfing?”, “Problem solving - my awareness?”, “Safety - my competences?” and “Communication - my competences?”	Adapted from, for example, which social media are used or equal
Manage and communicate information	“Reference management software - you use it?”, “Cite and refer sources - a must!” and “Copy right and Creative Commons - aware?”.	Adapted from, for example, the reference systems and reference management systems used or equal
Plan - find relevant information	“Search techniques and specialist search tools - do you have a clue?”, “Vocabularies and taxonomies - your knowledge?” and “Define a search strategy and search tool”	Adapted from, for example, the available databases at each academic institution used or similar
Identify and scope - search/find information	“Do you know the scientific sources?”, Use Library guides - research and topic guides, Apply the principles of effective searching?” and “Identify a search topic - using keywords and search words?”	Adapted from, for example, which Library Guides are available at each academic institution and subject used or similar
Identify, evaluate and avoid fake information	Almost no (Note: Newer custom games are available on the market-then not with the technical specifications that are appropriate for our target groups)	Adapted from, for example, which available secure and established news and public reliable sources are available at each academic institution and subject used or similar

Table 9: Matrix - Possible areas for the NAVIGAME game/s to develop with local adjustments. A summary.

### Example of complementary adjustment via open micro learning modules

As an example of adaptation (regarding the issue with local adjustments), the University of Gävle has a micro-learning course on information retrieval that could also possibly be used together with the NAVIGAME game. The thought here is that simple web link with integrated localization so students can proceed for in-depth learning at this open course module.



### Välkommen till Sökguiden!

Här guidas du genom informationsökningens fyra steg och lär dig att planera din sökning, att genomföra den, att ta fram materialet samt att granska och värdera det.

Om du använder Sökguiden för första gången, rekommenderar vi att du börjar med avsnittet "Publikationstyper och sökverktyg" - det ger dig en bra grund för den kommande sökprocessen.

Avsnittet öppnas i nya flikar i webbläsaren. För att komma till huvudmenyn välj fliken Sökguiden.

**The open course module Sökguiden!**  
(Search Guide) is licensed with CC and free to use and translate.

See the course module here:  
<http://www.opensnh.se/items/show/170>



Also, this open guide and micro learning module called Writing Guide, could be integrate, modified for the purpose of the NAVIGAME game/s. The Writingguide.se is a joint project within several university libraries by an editorial board - for production of open learning resources (OER). The OER module contain guidance for academic writing, reference management, publishing et cetera.

### Writing Guide



**The OER module Writingguide.se** (is licensed with CC and free to use and translate.

See the OER module here:  
<http://writingguide.se/>

Include ways to easy direct students to relevant LiBguides or open learning modules - have the coming games these possibilities to provide? Can the project take into account to increase the possibilities for students to use opportunities for deepening via micro learning - this will be good, as experiences from micro learning is positive - in sense of and to increase options for more Self-directed learning.

**Microlearning** can often be a part of learning by yourself in moments of time or just in time when needed - this can deliver a value for the students. Students can save time and the course module as the game is responsive and mobile, are interactive and flexible - as extend parts of the gamified interactivities. For student - short durations and are easily accessible via the game/s. Here specific needs of our Humanist students are addressed and using the just-in-time microlearning open course modules supply for deeper learning experiences if

needed. Student as learners no longer want to just gain relevant knowledge, they also want to be more entertained, engaged, and often able to apply what they learn immediately - this is the rationale behind micro learning.

**Nano-learning and Bite-sized learning** is newly being new trend, concepts and phenomena and described here as: Bite-sized learning is smaller parts than modular learning and with more specific (Learning Outcome) chunks at say maximum 5 – 15 minutes. Bite-sized learning is normally focused just on one key objective. The rationale behind this new learning methods is that the attention spans probably is getting shorter and learners expect more from training, serious games, distance learning et cetera. As learners, here the students want to be more in fully control of their “learning journeys” and yet be guided in the right direction in a professional way.



## Strategic education - output 2

*To summarize ....*

### **GOAL IN O2: GAME-BASED MODEL FOR INFORMATION LITERACY TRAINING**

“The partners will test a **teaching strategy** that will be consistent with the game-based learning model, organized in different stages.

The elaboration of a teaching strategy is connected with the determination/definition of the **learning pathways** and the routes of the games to be followed by the students and by the teachers/librarians. The game-based learning model will be **connected with IL pillars** via interactive learning objects/tools, including various learning scenarios and characters related to the learner, librarian and instructor.”

Here a summary in the first stages in O2 and for further work O3 - what we will outline in as our **teaching strategy**:

- Integration of the ordinary Curriculum with the librarian’s progression plans is vital part - here the project has several examples from Sweden and Bulgaria.
- User Cases with examples of teaching strategies from Sweden/Bulgaria and also from Focus group work in Italy.
- ADDIE design model mixed with AGILE design approach (for the production of game design)
- Competence Based Learning approach

The determination/definition of the **learning pathways**:

Is mostly dependent of what parts of the Competency tree Framework we choose to focus on - to be the learning modules for the game. Also, what mode and category of we choose to use for the game.

The game-based learning model and the **connected with IL pillars**:

Via interactive learning objects/tools, including various learning scenarios and characters related to the learner, librarian and instructor. Here as in the learning pathways is mostly dependent on what competencies we choose and prioritize from Competency tree Framework as learning modules (mainly What's missing from the 20 best analysed games).

Here we have choices about technical availability (accessibility), integration with LMS or not, mobile availability, forms and opportunities for interactive assessment within the game's learning modules. Learning scenarios will be dependent on the choice of game mode and game category and the main assessment type and models that will dominate the game.

# Experiences from other projects and research

## Student perspectives

According to the empirical study about how games can help students learn (Hamari, J et al, 2016)<sup>7</sup>, the study emphasizes the following for a game; Flow, engagement, and immersion in game-based learning, Challenge and skills in game-based learning for the engagement and immersion in game-based learning to get the perceived learning.

Survey instrument and factor loadings in the study for students, as following:

Factor:	Questions:
Learning	"Did you feel you were learning?"
Learning	"Playing the game increased my understanding of science"
Learning	"The game helped me learn"
Engagement	"How hard were you concentrating"
Engagement	"It provided content that focused my attention"
Engagement	"How much did you enjoy what you were doing?"
Engagement	"Interacting with it was entertaining"
Engagement	"Interacting with it was fun"
Engagement	"How interesting was the game?"
Engagement	"Did you feel bored with playing the game?" (reverse-coded)
Engagement	"Did you wish you were doing something else" (reverse-coded)
Immersion	"How immersed were you in the game?"
Immersion	"I lost track of time while playing it"
Immersion	"I became very involved in the game forgetting about other things"
Challenge	"Was it challenging?"
Challenge	"Playing it stretched my capabilities to the limit"
Skill	"I was not very good at the game"
Skill	"How skilled were you at the game?"
Skill	"I was very skilled at the game"

Table 10. Survey instrument and factors - learning, engagement, immersion, Challenge and skill

The implications for serious educational games in general from this study can be summarized as:

*" Games afford a great deal of individualized customization in terms of matching the challenges of the learning activity to a players skills as they progress. Results imply that the challenge of effective educational game design is for games to keep pace with the learner's growing abilities in order to facilitate continued learning in game-based learning environments." (p. 177)*

<sup>7</sup> URL:

[https://www.researchgate.net/publication/280294047\\_Challenging\\_games\\_help\\_students\\_learn\\_An\\_empirical\\_study\\_on\\_engagement\\_flow\\_and\\_immersion\\_in\\_game-based\\_learning](https://www.researchgate.net/publication/280294047_Challenging_games_help_students_learn_An_empirical_study_on_engagement_flow_and_immersion_in_game-based_learning)

In the comprehensive (285 pages) master study "Game based learning and library instruction" (de Kock, 2013)<sup>8</sup>, de Koch data analysis indicates that the games can be used in an effective way for library instruction purposes. The instructional design process (DODDEL model) was used for design of the game - with game-based learning criteria, and not the ADDIE model. DODDEL<sup>9</sup> model is more ideal for the use of novice game developer.

The study used the IL-Framework, the Big6. Comparison of different information standards and models was done. Also, was identified with a combined map reflecting activities from these IL-standards and models. SCONUL reflecting "Information gap" and Apply and communicate information to others mainly - in comparison with the other IL-standards and models.

A comparison between information literacy training and library instruction, showed clearly that both have a significant role to play. But the aspect is that library instruction teaches skills to students and information literacy training develop competencies, like:

- Competency to be aware that one need information
- Competency to realize what typ of information is needed
- Competency to organise information
- Competency to be aware of the ethical and legal issues of information
- Competency to evaluate information
- Competency to do problem solving
- Competency to acknowledge trends in information and technology

The criteria for an educational game (gamed based learning) given in the IL-context was:

- ✓ Enable
- ✓ Engage
- ✓ Target
- ✓ Preformance
- ✓ Feedback

**Enable** - learners should be empowered in the games, enable them to apply certain skills and capabilities. Also give them hints with problem solving and system thinking.

**Engage** - engagement and flow, important factors here are that engagement include skill, challenge and involvement and time. Immersion and engagement to improve the flow. Also, goal-driven activity can be important. This give motivation - game give extrinsic incentives the learners are rewarded. If the game enable relaxation (without resentments) - this can be a very important aspect.

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<sup>8</sup> URL: [https://repository.up.ac.za/bitstream/handle/2263/37275/De%20kock\\_Game-Based\\_2014.pdf?sequence=1](https://repository.up.ac.za/bitstream/handle/2263/37275/De%20kock_Game-Based_2014.pdf?sequence=1)

<sup>9</sup> URL: <https://pdfs.semanticscholar.org/a9d6/d31edea55a5725d036c2392402386d8b3ea0.pdf>

**Target** - for us in this project this is well defined. It important though to have clear goal for adult learners. Identify and identification in real and relevant context is a need for adult learning.

**Performance** - with meaningful goals, structures and scoring, difficulty levels, fantasy story lines or surprise factors. Challenge and competition is natural parts in games. The quality of rich media and text might have an influence on the performance of the learner/player.

**Feedback** - is vital parts for the games. The player should be well informed about where you are in the game and if you moving up to the different levels or is given new challenges. A good game should give feedback so the players is challenged but will be able to solve the problem. Feedback as scores, displays and verbal feedback or as given symbols - read here badges. Guidance and scores are here the main issue to have distinct design around.

**Further ways for evaluation - for O3**

Reflection for the work further on regarding evaluation of the IL-games as prototype can be related to the pedagogic playability heuristics and using participatory design<sup>10</sup> approach to build or evaluate the game-tool via semi-structured interviews - this when we have the questions “Which aspect can be improved?”, “How would we improve it?”, How can the game be more entertaining?” and “What do you thing of the learning content?”. In the research study “From Storyboard to Software: User Evaluation of an Information Literacy Game” (Guo, Y R and Goh, Dion Hoe-Lian (2016), the question is mentioned. I table 1 down below (Guo & Goh, 2016) aggregate the pedagogic playability heuristics and the interview data was organized by these attributes as following:

Attributes	Description
Captivation of Interest	The game should capture players’ interest and stimulate their curiosity. The storyline should relate to players’ life experiences, and there are variations in gameplay.
Meeting learning needs	The learning objectives and goals of the game should be clear to players. Players should be able to learn new concepts and skills.
Building confidence	The game should provide challenges at appropriate levels, that match players’ skills level. Players can easily get help and find it useful to achieve the learning objectives, and feel a sense of control of playing actions.
Self-assessment	Players should receive immediate feedback on their actions, and they can estimate their progress at each stage of game. The feedback and online help should reinforce players’ understanding.

Table 11. Pedagogical Playability Heuristics

<sup>10</sup> Participatory Design in Academic Libraries Methods, Findings, and Implementations (2012)  
 URL: <https://www.clir.org/pubs/reports/pub155/>

### **Example: Students statements - BiblioBouts**

From the research paper about the serious web-based BiblioBouts Information Literacy (IL) game<sup>11</sup>, regarding the increased student interest and engagement, this was the students conclusions:

*“Despite the game’s flaws, students in focus group interviews extolled the game’s benefits:*

- *Realizing that library databases yield sources that are qualitatively better than Google, Wikipedia, and the web*
- *Getting hands-on practice using a step-by-step approach for conducting library research and evaluating sources*
- *Finding relevant sources for their writing assignments that other students submitted to the game*
- *Reducing procrastination*
- *Giving access to many times more sources than they would have found on their own”*

If the game and the learning modules of the game can give indications of this kind of values it is interesting. If we can in the prototype project stage have survey or interviews - note this kind of area of statements.

The design of An Information Literacy Game<sup>12</sup> by Yan Ru GuoDion Hoe-Lian Goh (2014) point out that the design of the game includes these elements - making it suitable for designing a game:

- ✓ Concentration - keep players focused
- ✓ Challenge - enjoyable, provide appropriate challenges
- ✓ Players skills - must be matched with the game challenges
- ✓ Control - over interface, characters and events, can follow the linear structure
- ✓ Clear goals - established through narratives or backstories
- ✓ Feedback - continuous feedback, so they understand actions
- ✓ Immersion - deep yet effortless involvement
- ✓ Social interaction - provide players to interact, cooperate or compete

In the article about the ARG game Nomade (Jerrett et al, 2017)<sup>13</sup>, describes some shortcoming in the Nomad’s implementation:

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<sup>11</sup> Markey, Karen & Leeder, Chris. (2011). Students’ Behaviour Playing an Online Information Literacy Game. Journal of Information Literacy. 5. 10.11645/5.2.1637. URL: [https://www.researchgate.net/publication/270711731\\_Students'\\_Behaviour\\_Playing\\_an\\_Online\\_Information\\_Literacy\\_Game](https://www.researchgate.net/publication/270711731_Students'_Behaviour_Playing_an_Online_Information_Literacy_Game)

<sup>12</sup> Guo Y.R., Goh D.H.L. (2014) The Design of an Information Literacy Game. In: Tuamsuk K., Jatowt A., Rasmussen E. (eds) The Emergence of Digital Libraries – Research and Practices. ICADL 2014. Lecture Notes in Computer Science, vol 8839. Springer, Cham URL: [https://link.springer.com/chapter/10.1007%2F978-3-319-12823-8\\_37](https://link.springer.com/chapter/10.1007%2F978-3-319-12823-8_37)

<sup>13</sup> URL: <https://www.emeraldinsight.com/doi/full/10.1108/AJIM-11-2016-0185>

- ✓ Elements of the game were repetitive - the repetition became boring (here played in group)
- ✓ Game web site was slow servers and poor integration - often long access time. Which frustrated the players.
- ✓ Game timeline should have more clarity and transparency. Given timelines for completion of the puzzle in order to motivate play.
- ✓ Some game puzzle did not fit the game narrative as previous puzzle. Boring as a result.
- ✓ In order to vary the gameplay - diversify locations, such as the library.

### **Data literacy - nearby competencies when open data is more public common**

In the Purdue Information Literacy Handbooks - Data Information Literacy for Liberians, Data, and Education of a New Generation of Researchers (2015). The authors refer to Qin and D'Ignazio (2010) with a developed a model for, Science Data Literacy, this to address the production aspect of data management. Here is the definition for SDL:

*"SDL refers to "the ability to understand, use, and manage science data" (p. 2) and an SDL education serves two different, though related, purposes: one is for students to become e-science data literate so that they can be effective science workers, and the other is for students to become e-science data management professionals." (page 15)*

According the handbook the "Prior Instructional Efforts in Data Information Literacy" (named DIL). Several libraries have developed programs or prototypes to address those needs. This nearby competency will be further on more important event for Humanities students in general - more and more information and data are going to be more of open data and even for students to reach relevant information the question of GDPR and archive (preservation of data), spread and sharing data in ethical acceptable ways is important. Student have to be aware of what statistics is relevant and good - were the data is coming from and in what ways it's presented, presented in data tables or in a visual way. Here false content and visual information is not easy to disclose.

If we have asked the humanist students in our survey how to understand the concept of a database or how to query those databases - what have been the answers? Not all of the competencies down below in DIL is relevant for just our Humanities students - but probably good to reflect on.

This guide/handbook takes up the ACRL Standard that state information what literate individuals are able to do with a comparison of Data Information Literacy.

Here examples of DIL-competencies organized in major categories:

Introduction to database and data formats

Discovery and acquisition of data  
Data management and organization  
Data conversion and interoperability  
Quality assurance  
Metadata  
Data curation and reuse  
Cultures of practice  
Data preservation  
Data analysis  
Data visualization  
Ethics, including citation of data

The Massachusetts Institute of Technology Libraries created a robust “Manage Your Data” subject guide/tutorial, supplemented by seminars such as Managing Research Data 101 (Graham, McNeill, & Stout, 2011). Both resources include data planning checklists that include the following topics:

- Documentation and metadata
- Security and backups
- Directory structures and naming conventions
- Data sharing and citation
- Data integration
- Good file formats for long-term access
- Best practices for data retention and archiving

In the context of data information literacy, we in Sweden have the topic (MIK) Digital Media literacy. In elementary school is now introduced as compulsory subject programming. Training in Media and Information literacy (MIL)<sup>14</sup> needs here be more understood and to be expanded, and perhaps started earlier - than before academic studies. We hopefully need to learn to evaluate false or misleading information as conceivable sub-components of larger narratives. Students need now knowledge about databases (how they work), deep fake (example: the ability to add speech to someone else's mouth in videos), basic knowledge of how algorithms work and artificial intelligence (AI). We need to learn how the impact processes look and why we allow ourselves to be manipulated. Digital development is now very fast and the framework that information literacy now contains is sometimes somewhat outdated. The question is what we in this project can add extra that are not found in today's framework for digital competence or information competence?

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<sup>14</sup> URL: [http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/mil\\_five\\_laws\\_english.png](http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/mil_five_laws_english.png) and <https://en.unesco.org/themes/media-and-information-literacy>

# Gamification - the keys and success factors

Based on the experience of O2 with the analysis of the 20 best games on information literacy, we can ourselves reflect on and discuss what success factors we believe we get by prioritizing functionality, which learning modules should be involved and what form of interactivity and assessment with feedback needed to be included in the game. This element of the IL strategy can be carried out at a workshop on possible and important choices for O3.

Below are some selected discussion points for joint reflection for further prioritization in O3. About IL-gamification (our view):

Preferable learning module from the Competency tree Framework

Game format/mode/category

Playing time

Game rules

Playing solo/in group/compete/collaborate

Triggers, badges, hints, guidance

Assessment and feedback type/model

Instructor guidelines

Usability and accessibility aspects (responsive et cetera)





# Proposal of learning situations for the games

## Learning theories and incentives

NAVIGATE focus on learning not instruction. Students do not memorize facts but apply information in order to solve game related problem. A lot of games working with extrinsic motivation to learn the topic.

But the Self-determination theory can let us see more that self-determination broadly states the psychological needs that internally motivate humans to take action and be effective — autonomy and competence.

## The Self-Determination Theory

The Self-Determination Theory (SDT)<sup>16</sup> - about motivation to understand our intrinsic tendencies to go effective. SDT motivate via three elements: Autonomy, Relatedness and Competence.

Three Innate Psychological Needs Comprise Self-Determination Theory of Student Motivation:

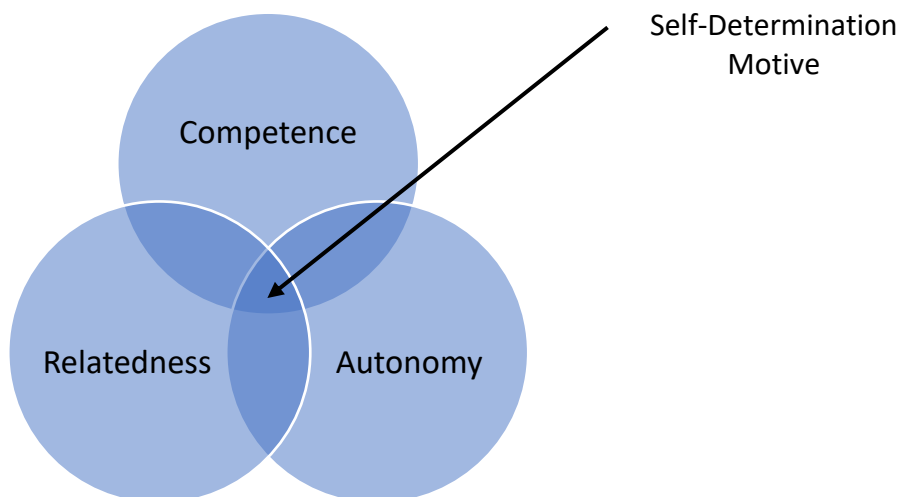


Figure 3. Relation Competence, Relatedness and Autonomy

Competence is need to feel self-efficacy but also experiences mastery.

Autonomy is here urge to be a causal agent of your own life and to control your own choices.

Relatedness is meant as a universal - you want to interact, be connected to and have experiences of caring for others.

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<sup>16</sup> <http://selfdeterminationtheory.org/> and Chou, Yu-Kai (2016). *Actionable gamification: beyond points, badges, and leaderboards*. [Revised]. Fremont, CA: Octalysis Group

### The Four Player Types

Richard Bartle's Four Players Types<sup>17</sup> - is often used by game designers - from main groups of players doing four distinct types of activities. This model emanates from the 1970s (MUD games):

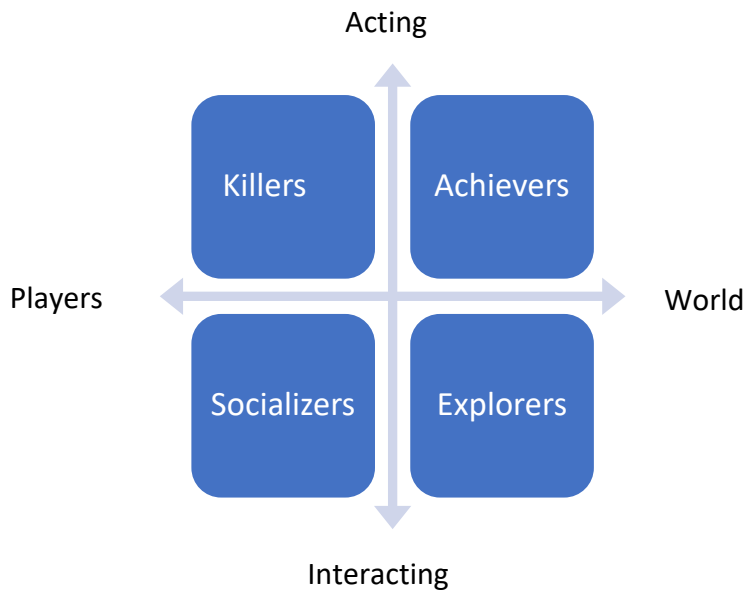


Figure 4. Four Players Types - Bartle's

Game Designer Amy Jo Kim use R Bartle's Player Types, but evolving them into the matrix model **Kim's Social Action Matrix**<sup>18</sup>:

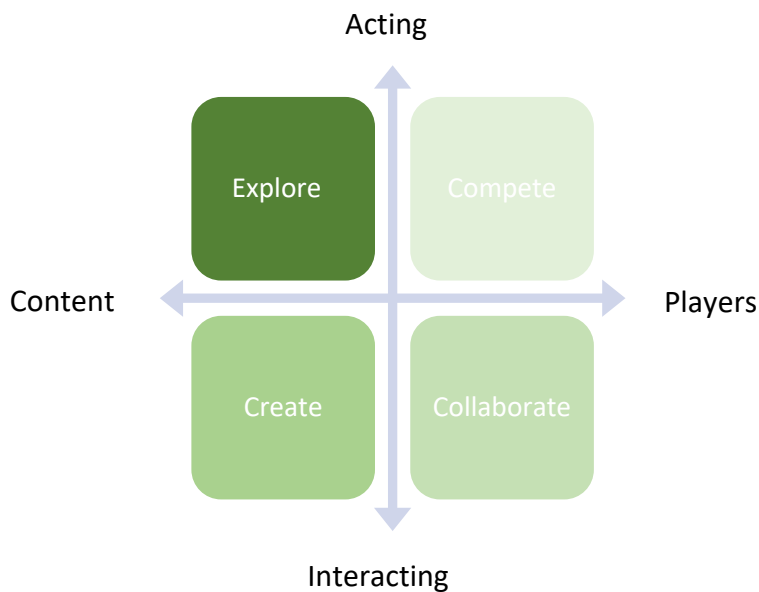


Figure 5. Kim's Social Action Matrix

The model assigns other verbs and actions - and stimulate us to design a fun and engaging environment within the game/s.

<sup>17</sup> Chou, Yu-Kai (2016). *Actionable gamification: beyond points, badges, and leaderboards*. [Revised]. Fremont, CA: Octalysis Group

<sup>18</sup> Chou, Yu-Kai (2016). *Actionable gamification: beyond points, badges, and leaderboards*. [Revised]. Fremont, CA: Octalysis Group

### **The Social aspect**

Games are collaborative (or competitive) and student learn and teach in the same time or asynchronous.

### **Appropriate Learning Curve**

It's also highly important that easy to reach, log on, log in and have access (mobile and accessibility standard) to the games. Also, the learner of the games has to have a good balance with learning and challenges. Here the games also will provide a clear success marker (score, how to win, when failed, trophies, achievements, badges et cetera).

### **Digital badges**

Digital badges<sup>19</sup> can be a concept to visual credentials and learning done in the game.

Gee (2003) most important features of games are: games as situated content (importance of the context), start from problems, the need of experiment with solutions and the ability to fail and learn from that failure.

To develop modules – or choosing an already existing games we can to start from an outline of major content areas (The competencies gap and Competencies framework in Table 1.) to define some of the:

- goals and objectives,
- instructional activities and
- a plan for assessing learning outcomes.

Using the IL Scenario strategy with some user cases prepare, some personas described, we can decide if the NAVIGAME games are based on activities embedded and independent by a curriculum. If independent, a discussion about assessment models and credentials is important.

### **Game based blueprint**

A game blueprint here, describes:

- learning objectives and outcomes,
- assessment strategies and
- activities.

It can be an “inquiry-based,” collaborative, and “project-based” learning environment in which each module revolves around key redesign challenges and questions, group discussions and activities, and the creation of redesigned course materials.

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<sup>19</sup> URL: <https://openbadges.org/> and

## Towards mobile learning and for research propose<sup>20</sup>

In the matrix and model presented down here, *the challenges are for the project is towards - move from "Trivia"- see the old simple academic produced games in the O2, into the spaces of information gathering (learning to structure and organized knowledge) and research (investigate, produces knowledge) as shown down below - if the games also shall work in a non-formal educational setting/situation, is it important that the students can be using mobile devices.*


	Casual	Lookup	Learn	Investigate
Information	Window shopping	Trivia 	Information Gathering	Research
Geographic	Friend Check-Ins	Directions	Local Point of Interest	Travel Planning
Personal information management	Checking Notifications	Checking Calendar	Situation Analysis	Lifestyle Planning
Transactional	Acting on Notifications	Price Comparison	Online Shopping	Product Monitoring

Table 12: Moving Game (Trivia) into learning and research. A matrix of mobile information needs. Modified (Figure 8.5, simplified) from Tony Russel- Rose and Tyler Tate (2013).

<sup>20</sup> Russell-Rose, T. & Tate, T. (2013[2013]). *Designing the search experience: the information architecture of discovery*.

Jarvelin, K., & Ingwersen, P. (2004). Information seeking research needs extension towards tas and technology. *Information Research*, 10(1), 212 URL: <https://eric.ed.gov/?id=EJ1082037>

Myrhaug, H. I. & Goker, A. (2003) *AmbieSense – interactive information channels in the surroundings of the mobile user*. Second International Conference on Universal Access in Human-Computer Interaction. July. Crete: Lawrence Erlbaum Associates

Russell-Rose, T. & Tate, T. (2013[2013]). *Designing the search experience: the information architecture of discovery*. Page 222-227.

Walsh, A. 2012. Mobile information literacy: a preliminary outline of information behaviour in a mobile environment. *Journal of Information Literacy*, 6(2), pp. 56-69.

<http://ojs.lboro.ac.uk/ojs/index.php/JIL/article/view/PRA-V6-I2-2012-4>

## Use-cases - possible learning situations with the game/s and Competency tree

Competency tree Framework - Implementation and strategy for the IL instruction.

Trainer and student perspective regarding apply, utilize - the games and Competency tree Framework and the learning situations for the students. Examples - Anchored Instruction<sup>21</sup>:

Models of use of the game and Competency tree Framework - (trainer)	Types of use of the game, regarding the specific skill - (student)	Learning situations - (student) (formal, informal, mobile, non-mobile)
Free and flexible use of just the Competency tree Framework - appraisal usage	Free game used via the university web site	Mobile, informal settings
Freely use, modify, share and adapted use of the information and knowledge in the Competency tree Framework	Free use of the games via placement in <i>Libguides</i> and in university library web sites	Mobile, informal settings
Adapted use as self-assessment the whole course or educational program as a service for the university library	Adapted use as self-assessment the whole course or educational program as a service for the university library	Mobile, informal settings
Recommended (guided, directed) use of the information and knowledge in the Competency tree Framework	Recommended use of the games via open educational resource as course content in the learning management system (in LMS as an OER-module)	In the course platform, informal setting Mobile, informal settings
Instruction via trainers (teacher, librarian) via progression plan	Recommended use of the games in formal or informal settings	In lecture, formal setting Mobile, informal settings
Instruction via trainer in workshop as practice exercise - for practice game and inform students about information and digital literacy - avoiding fake info	Instructed use of games as training and adapted learning	Non-mobile in lecture-room with the university computer or BOYD. Both non-mobile, mobile and within formal setting
Integrated learning modules for non-designed assignment regarding information literacy of avoiding fake information - complementary and additional course material	Motivated use of the games, game-based learning	Adapted learning with badges for self-directed learning in more formal setting and in direct relation to specific course module or specific course. Mobile and informal setting

<sup>21</sup> This user-cases is inspired by the learning context and so called Anchored Instruction. "**Anchored instruction** is a technology-based learning approach which stresses the importance of placing learning within a meaningful, problem-solving context. A form of situated learning, **anchored instruction** uses context - stories or micro - to situate the learning and application of knowledge." URL:

<http://web.cortland.edu/frieda/id/idtheories/41.html> and [https://en.wikipedia.org/wiki/Anchored\\_Instruction](https://en.wikipedia.org/wiki/Anchored_Instruction)

<b>Models of use of the game and Competency tree Framework - (trainer)</b>	<b>Types of use of the game, regarding the specific skill - (student)</b>	<b>Learning situations - (student) (formal, informal, mobile, non-mobile)</b>
Integrated learning modules for specific designed assignment regarding information literacy of avoiding fake information - as instructed and additional course material	Complementary and recommended use of the specific games relevant and connected to the specific area of skill regarding the assignment/task	Mobile and non-mobile, informal setting
Assessments with integrated learning modules for specific designed assignment regarding information literacy of avoiding fake information - as instructed course material - using specific Rubric (assessment criteria)	Complementary and recommended use of the specific games relevant and connected to the specific area of skill in the rubric - directly open informed or not informed or mention in beforehand or in the study guide or assignment as assessment	Mobile and non-mobile, informal setting
When writing essay or thesis - instruct and recommend the Competency tree Framework to show that specific, particular skills is more important than other regarding to the topic or research method used in the student work	Recommended specific game modules for training the use or make conscious regarding critical and crucial skill in the context of the student work - <i>as Anchored instructions</i>	Mobile and non-mobile, informal setting

Table 13: Use-cases - possible learning situations with the game/s and Competency tree

## Experiences from Focus group work within the project

The Italian team had a Focus group working with the overall issue - Implementation and Strategy for IL instruction - Humanities Faculty use case.

The NAVIGATE project aims are to give the teachers / trainers the powerful support for using games in the IL courses. Current documentation<sup>22</sup> - outcome from the workshop - down below offers example of learning situations - as a strategy for it as well as the implementation guidelines.

Examples of adaptation of the Navigate Strategy - learning situations:

<b>Models of use of the Competency tree Framework (Teacher Embedded Games)</b>	<b>Types of use of the game, regarding the specific skill (student)</b>
The teacher uses the games based on the Navigate Competency Framework for a hierarchy of the sources of the discipline	Free game use via university e-learning system and library web sites
Recommended (guided, directed) use of the games for avoiding Plagium and understanding IPR and Creative Commons in the Competency tree Framework	Recommended use of the games on Plagium via open educational resource as course content in the learning management system (in LMS as a OER-module)
Instruction by teacher and librarian to use dictionaries based on quality criteria and avoiding fake content	Recommended use of the Dictionary games in formal or informal settings
Instruction via teacher in workshop as practice exercise - for practice game and inform students about avoiding to create fake info	Instructed use of games as training and adapted learning to create academic (not fake) content
Integrated learning modules for written or group assignment regarding avoiding creating fake information - complementary and additional course material	Motivated use of the games for course assignment, embedding game-based learning for avoiding fake content in creating document
Teachers bring the value of the context with games on the line time to the subject information	Recommended specific game modules on line time for training the use or make conscious regarding critical and crucial skill in the context
Integrated learning modules for specific designed assignment regarding avoiding fake information - as instructed and additional course material	Complementary and recommended use of the specific games relevant and connected to the specific area of skill for avoiding fake content regarding the assignment/task
Assessments with integrated learning modules for specific designed assignment regarding information literacy of avoiding fake information - as instructed course material - using specific Rubric (assessment criteria)	Complementary and recommended use of the specific games for avoiding fake content relevant and connected to the specific area of skill in the rubric - calculated as additional ECTS in the study guide or assignment as assessment

Table 14. Experiences from Focus group - learning situations

<sup>22</sup> URL: [https://docs.google.com/document/d/16hXoicHtq\\_HeuK34NvsmvgTVXsaLe9ygkDhYq-YS22w/edit#](https://docs.google.com/document/d/16hXoicHtq_HeuK34NvsmvgTVXsaLe9ygkDhYq-YS22w/edit#)



### **Guided Organizer as teaching method - idea**

Guided Organizer via Guided Inquiry<sup>23</sup> - is a way for instructors to use “inquiry methods” and then to promote learning through the learner investigation, often following the same process used by scientists/researchers.

By using real data sets from working scientists, the learner can focus the efforts on searching comparison data, analysis and evaluation. These activities mirror the scientific/research methods that can lead to more questions and additional research activities.

Game-based learning here is to semi-simulate this learning process with some given data, students have to give the relevant search term (Boolean Search Operators), then to organize this data and give (choose) by statements that is testable. Player use relevant website (information given by the system) and players choose given scenarios - data & graphs and choose given conclusion using a rubric.

### **Games, competency frameworks/curriculum frameworks together with e-portfolio - idea**

To give the player a digital platform for more reflect and follow up the skills and competency done in relation to the artifact and research/scientific writing - a e-portfolio can be used with the Competency tree via the Justframework.com web platform. The e-portfolio from in combination with using badges, here OpenBadges.me<sup>24</sup>.

The e-portfolio is called MyShowCase.me<sup>25</sup> and is free to use for individual learners. If used fully with grading workflow, showcase and submission feedback, badges, rubric and progress reporting against frameworks and standards in Justframeworks.com - it's a license and have an organization account.

But individual users can also discover and use standards and framework from Justframeworks.com - in this case the Competency tree framework. This could be a way for librarians and students to have more overview and control what competencies and skills are linked to certain parts of the writing process of essays et cetera.

Via Justframeworks.com we can download the XML-file for use in when programming the game/s with metadata and descriptions et cetera.

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<sup>23</sup> URL: [http://www.miseagrant.umich.edu/lessons/files/2013/05/Guided-Inquiry-Diagram\\_2012.jpg](http://www.miseagrant.umich.edu/lessons/files/2013/05/Guided-Inquiry-Diagram_2012.jpg) and <http://www.miseagrant.umich.edu/lessons/teacher-tools/guided-inquiry-process/>

<sup>24</sup> URL: <https://www.openbadges.me/>

<sup>25</sup> URL: <https://www.myshowcase.me/>

### Peer learning - idea

Game design form - provide teachers guidance for a collaborative learning situation.

Here for instance is a short explaining for the steps for designing the game in collaborative learning situations:

Learning situation - student group	Can be offered to a hole class in a lecture situation, as in a formal setting. Or as a refresher for more advanced aims after this learning activity. Incorporated in a PBL fixed with resource session to address a specific need, search task or in a problem, example of fake content etc.
Playing time	20 min
Game rules	Students are, or not allow to consult other material during the game
Learning objective	To understand search techniques
Learning outcome	Student will be familiar and have an overview with the different search techniques and know what each of the achieves
Aim of game	Match the search technique to what is does
Game description (learning module/s and activities)	The game/s modules will be described here...
Instructor guidelines	Arrange students into the groups. Explain purpose, playing time, games rules, the games learning activities. If you want - you can go through and provide the correct answers ("correct play") with the students. Include question on the games in the assessment.
Feedback from students (soft data and learning assessment)	Have they gain or imply deeper learning, critical thinking, knowledge transfer, retention and understanding of broader applications etc.
Learning Analytic (hard data)	Check statistic data, learners actual records in the games

Table 15. Example, collaborative learning situation

# Possible learning modules and suitable learning outcomes

## Learning Analytic - statistics of activities and maintaining learners record

In the paper Game Learning Analytics: Learning Analytics for Serious Games<sup>26</sup> (chapter - In book: Learning, Design, and Technology, pp.1-29) by Freire, Manuel et al (2016), the basic principles for Learning Analytic regarding the benefits (p. 4):

*“In particular, we describe how the use of data analysis and visualization techniques can be applied in order to:*

- 1. Predict student performance*
- 2. Provide students with personalized and scaffolded game experiences*
- 3. Increase student retention rates (i.e. fewer dropouts)*
- 4. Improve the design of future serious games*
- 5. Improve the cost-efficiency of using games in education”*

Implementation is done to store the data separate remote server - rather than inside the game. It's here important that data can be aggregated, analyses tweaked - without have to modify the game code. A conceptual architecture for a Game Analytics System is also shown (Figure 2, p 23). Also, a Logical architecture of a generic game learning analytics system for use with serious games (Figure 3, sid 28) is presented.

Game Learning Analytics is defined after some basic principles - with the following artifacts:

- ✓ Instrumentation
- ✓ Collect and Storage
- ✓ Real-time analytics
- ✓ Aggregated (batched) analysis
- ✓ Key performance indicators (KPI)
- ✓ Analytic Dashboard

The importance of measure outcomes - is partly depending on how learning analysis is handled in the game.

Privacy, ethics and GDPR is important task to ensure a good way to handle the learning analytic data and information - this created by the users, as learners (student). What data should be open or not is vital to decide - for not to revealing personally identifiable information.

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<sup>26</sup> Freire, Manuel & Serrano-Laguna, Ángel & Manero, Borja & Martinez-Ortiz, Ivan & Moreno Ger, Pablo & Fernández-Manjón, Baltasar. (2016). Game Learning Analytics: Learning Analytics for Serious Games. 10.1007/978-3-319-17727-4\_21-1.

URL:

[https://www.researchgate.net/publication/305371728\\_Game\\_Learning\\_Analytics\\_Learning\\_Analytics\\_for\\_Serious\\_Games](https://www.researchgate.net/publication/305371728_Game_Learning_Analytics_Learning_Analytics_for_Serious_Games)

## Designing modules and learning situations

Re-design learning for Gamification - The Learning Experiences Canvas<sup>27</sup> is a FREE powerful tool for designing the best learning experiences you can imagine. It's great for teachers, trainers, publishers or anybody interested in creating better ways of learning. We can use it freely with CC-licens: <https://creativecommons.org/licenses/by-nc-nd/4.0/> - we will also get a free e-book: "Five Critical Questions" as a bonus.

Download here: <http://www.lxcanvas.com>

Why use the LX Canvas? There are many reasons to use the LX Canvas. These are the most important five (except the one that it's free):

- ✓ It structures your design process
- ✓ It gives a complete and clear overview
- ✓ It helps to make the right decisions
- ✓ It's easy to use
- ✓ It's very versatile

## Learning outcomes - for writing intended learning outcomes

The Swedish project Kursutveckling.se - for writing intended learning outcomes, have document describing the process of writing intended learning outcomes is now translated to English<sup>28</sup>. A guide: writing intended learning outcomes at module level. Free to use.

Download here: [http://www.kursutveckling.se/dok/Larandemal\\_eng\\_061011.pdf](http://www.kursutveckling.se/dok/Larandemal_eng_061011.pdf)

Here is also guidance regarding, categories, cognitive process and adverbs and writing Learning Outcomes - TALOE EU-project: <https://taloetool.up.pt/writing-learning-outcomes/>

## Instructional Designer - Learning Experience Design and Accessibility

We can't in this project now if all participants know these types of development work in the educational field. Instructional Designer - What Does an Instructional Designer Do?<sup>29</sup>

*"Learning experience design (LX Design) is the process of creating learning experiences that enable the learner to achieve the desired learning outcome in a human centered and goal-oriented way."*<sup>30</sup> Statement: Niels Floor

User experience Design (UX, UXD or XD) This also include the question of the games Accessibility. The games must follow the new EU-rules and regulation regarding this issue. Universal Design<sup>31</sup> for Learning is the term we have to take in mind/account - That the game and any game module with technology tools meet accessibility standards.

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<sup>27</sup> <http://www.learningexperiencedesign.com/lx-canvas.html> and <http://www.learningexperiencedesign.com/learn-1.html>

<sup>28</sup> WRITING INTENDED LEARNING OUTCOMES Version 1, 2006-10-11 A guide: writing intended learning outcomes at module level

<sup>29</sup> <https://elearningindustry.com/what-does-an-instructional-designer-do-infographic>

<sup>30</sup> <https://medium.com/@alejandroglezf/instructional-design-and-learning-experience-design-5625d91686ca> and <https://www.shiftelearning.com/blog/learning-experience-design-best-resources>

<sup>31</sup> URL: <http://www.cast.org/our-work/about-udl.html#.XG0PNJNKi8g> and <https://oscar.org/standard15/>

## Accessibility and Quality systems for distance and online learning

The Quality Matters (QM) rubric is a well spread international standard for evaluating online and

hybrid courses et cetera. It has established national quality standards for online courses, with a faculty-driven peer-review process (Maryland Online, Inc., 2019). Go to:

<http://www.qualitymatters.org/>

QM provides eight broad quality standards, which can be further broken down into sub-standards if desired: The Quality Matters rubric is designed to help teachers, instructional designer and faculty review their own courses across eight broad standards.

1. Course Overview and Introduction
2. Learning Objectives (Competencies)
3. Assessment and Measurement
4. Instructional Materials
5. Learning Activities and Learner Interactions
6. Course Technology
7. Learner Support
8. Accessibility and Usability

## Quality models in online and open education around the globe: State of the art and recommendations

QM is only one of many Quality models for online and open education. ICDE - International council for open and distance learning have done an overview-report<sup>32</sup> with all the quality models for online and open education around the globe.

For us in this project the quality standard models - underpin not only the learning for students with the games, but also the service and student support, course design and the side of our job for O3, the strategic planning and development. (Ossiannilsson, 2012)<sup>33</sup>

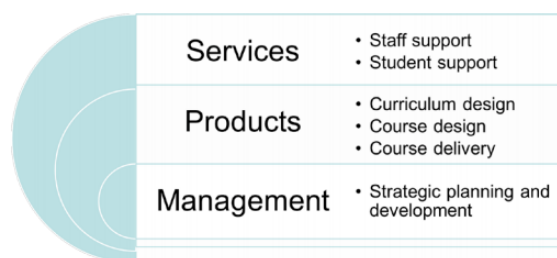


Fig 1 Three significant main areas related to quality in online learning, including e-learning (Ossiannilsson 2012)

<sup>32</sup> [https://www.icde.org/assets/WHAT\\_WE\\_DO/icdequalitymodels22.pdf](https://www.icde.org/assets/WHAT_WE_DO/icdequalitymodels22.pdf)

<sup>33</sup> Ossiannilsson E (2012) Benchmarking e-learning in Higher Education: lessons learned from international projects. Doctoral dissertation, University of Oulu Graduate School; University of Oulu, Faculty of Technology, Department of Industrial Engineering and Management, University of Oulu, Finland. URI: <http://herkules.oulu.fi/isbn9789526200415/isbn9789526200415.pdf>

## Quality criteria for digital learning games (DLG)

Hense, J & Mandl, Heinz (2012)<sup>34</sup> describe quality criteria for DLG as following (p. 24):

1. Clearly define the learning goals of the game without neglecting the playful elements
2. Make use of the full spectrum of learning principles used in digital games
  - a. Behaviorist principles
    - ✓ provide direct feedback (particularly reinforcement) on learners' actions
    - ✓ give opportunities for exercise and practice
  - b. Cognitivist principles
    - ✓ embed complex problems within the game context
    - ✓ embed information needed to solve the problems within the game context and narrative
  - c. Constructivist principles
    - ✓ create realistic problems which are authentic and personally relevant to the players
    - ✓ offer different perspectives and contexts for a given content
    - ✓ create a social context for learning
    - ✓ provide instructional support
    - ✓ offer opportunities for learners' own construction processes
3. Evoke positive emotions
  - a. Guarantee that learners have fun, e.g.
    - ✓ provide an attractive game design
    - ✓ maximize usability
    - ✓ avoid frustration and disappointment
  - b. Provoke learners' curiosity, e.g.
    - ✓ offer different choices
    - ✓ offer opportunities for exploration
  - c. Allow for satisfaction and pride
    - ✓ provide positive feedback for learners' accomplishments
    - ✓ create opportunities for presentation of learners' accomplishments
    - ✓ don't let learners fail (too often)
4. Evoke and keep up motivation
  - a. Foster intrinsic motivation
    - ✓ make learning and playing intrinsically attractive
    - ✓ avoid too much focus on extrinsic rewards (score, awards etc.)
  - b. Allow for feelings of competence
    - ✓ set goals which are challenging yet realistic given the learners' ability
    - ✓ give learners complete control over their success (reduce influence of chance)
    - ✓ ensure frequent and constant opportunities for feeling competent
  - c. Provide autonomy
    - ✓ provide freedom choice, but avoid too much uncertainty about possible negative consequences
    - ✓ provide freedom of action
  - d. Enable social relatedness
    - ✓ provide in-game cooperation with real and/or virtual partners
    - ✓ create game-related communities of learners
  - e. Meet learners' interests
    - ✓ tailor game subject, narrative, and genre to learners' interests
    - ✓ offer choices for the different interests of different learners
  - f. Enable flow
    - ✓ clearly state learners' goals at each stage of the game
    - ✓ adapt difficulty level to learners' ability and skills
    - ✓ provide constant, immediate and informative feedback

This Quality criteria for the design, quality analysis, and evaluation of DLGs have challenges. The authors have for the sake of applicability, note that the criteria here are presented in the form of recommendations.

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<sup>34</sup> URL: <https://pdfs.semanticscholar.org/219c/0a909d16120b926565298f864a2680b0cd21.pdf>

# Feasible strategy

## Practical project limitation

Even in academic projects the terms of time / quality / costs are here vital for a successful project outcome. Here we have to adjust, prioritize and take into account the Project management triangle<sup>35</sup>.

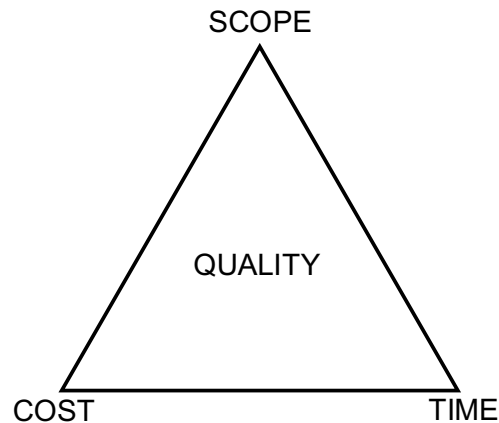


Figure 6: Project management triangle

I O1 (survey and reports, selection of frameworks and construct the competency tree framework) and O2 (analysis, categorizes games, construct visual database) we note that the coordination, communication get the job done take time and efforts for the project members and project team.

It's highly important that the O3 with game design prototyping, testing and so on, will not be weighed down by too much of traditional course design methodology that is more adapted to create campus training programs and curricula in traditional academic courses.

The game (NAVIGAME) will be based on gamification as concept of learning in a new innovative way.

## Integration with LMS (Learning Management System)

If the game shall be working along with LMS, and for example be integrated and "talk" with the Gradebook in the LMS - it's good to follow the Learning Tools Interoperability (LTI-standard) from IMS Global Learning Consortium:

<https://www.imsglobal.org/activity/learning-tools-interoperability>

This integration is one way to get closer to the net-based and online with distance learning activities - both for students, instructor/teacher and librarian.

The limitation for the building this LTI-integration will be decided. It's going to take time and efforts from the project resources. But we can also build the game - so other parts beyond can do the work - if the IT-structure is open built to add on this feature and functionality.

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<sup>35</sup> URL: [https://en.wikipedia.org/wiki/Project\\_management\\_triangle](https://en.wikipedia.org/wiki/Project_management_triangle)

Same issue is regarding if the game need log in - we can use the SAML 2.0 log in federation, this is one possibility: [https://en.wikipedia.org/wiki/SAML\\_2.0](https://en.wikipedia.org/wiki/SAML_2.0) (fore more easy log in for several universities and schools at the same time). In Sweden the federation is called SWAMID for universities: <https://wiki.sunet.se/display/SWAMID/SAML+WebSSO+Identity+Provider+Best+Current+Practice> and for schools called Skolfederation.se: <https://www.skolfederation.se/>

### **Practical insight around technical metadata standard - games as OER<sup>36</sup>**

The game will have metadata as open educational resources (OER) and it is more the query which metadata standard will be used. There are several standard and good pondering through thoroughly, whether the game should be able to be integrated into other learning platforms or CMS, even then we need to have the game published via some OER repositories (type MERLOT.org)<sup>37</sup>.

To add metadata to content and learning tools consuming time resources.

LRMI, the Learning Resource Metadata [1] initiative has been adopted by and integrated within Schema.org under "Creative Work" and includes things like learning resource type [3], intended audience, typical age range, and the very important "AlignmentObject" [3]. This work has more recently been harmonized into other specifications/metadata models such as CEDS [4], and the new IMS Global LTI Resource Search standard [5]. The LRMI taskforce is right now discussing specific vocabularies for resource types [6]. Lastly, and in support of these initiative, the IMS Global CASE [7] ("Competencies and Academic Standards Exchange") address how to create and exchange a learning standards or competency framework (e.g. what a student must learn and demonstrate to provide learning or master) and [8] OPEN EDUCATIONAL RESOURCES SCHEMA COMMUNITY GROUPS mission is to develop a universal RDF vocabulary to enhance open educational resources throughout the internet. [9] Deconstruct and use bit of content in the OER with <http://oerschema.org/>

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<sup>36</sup> About metadata standards - references:

[1] <http://lrmi.dublincore.org/>

[2] <https://schema.org/LearningResourceType>

[3] <https://schema.org/AlignmentObject>

[4] <https://ceds.ed.gov/element/000928/> (example for resource type elements)

[5] <https://www.imsglobal.org/resource-search>

[6] [https://docs.google.com/document/d/1u7Nniey6SMDCjXBOLws7IRrtNaXvYe6tvfDof8Po\\_Ck/edit#heading=h.vb28knroittx](https://docs.google.com/document/d/1u7Nniey6SMDCjXBOLws7IRrtNaXvYe6tvfDof8Po_Ck/edit#heading=h.vb28knroittx)

[7] <https://www.imsglobal.org/activity/case>

[8] <https://www.w3.org/community/oerschema/> and [9] <http://oerschema.org/>

<sup>37</sup> URL: <https://www.merlot.org/merlot/index.htm>



# Thinkable and opportunities with a strategy

The games will have possible results/record of the learner as Learning Analytic. With this the game and the learner can identify key indicators.

The game can identify Pre-Requisite Skills in order to define the contents parameters. Some self-assessment before running the game could be done. This also to address the relevant level (basic or independent or other level categories) and specific content with activities. This may also be a sort of adapted learning game-structure - the learner gives what is needed for the identified level of pre-requisite skills by the game.

The player can in the larger curriculum picture with intended goals, given topic identified - content decisions made and offered by the game.

The game it's self can identify the Instructional Format. Have answers initial from the users in the context of curriculum development "format", here to deliver the proposals of elements of resources, methods, time frame, sequence, location, peer-group, individualization with affective and social factors included.

Example: You are a new "first-time" student interested to learn by yourself with a sort of given feedback and responses both from other individuals and from the system. The student doesn't want to compete with others but will have hints from the system when do wrong or just see how his level is compared with other in this situation. How many have done it right or wrong et cetera. How to keep the student on track or contact the learner if the player doesn't come back after a while will be a problem - the game will have incentives for him/her to come back, or not?

All these complex choices are both time and resource costly to produce - and give more or less possibilities to individualize or contextualize the game for a given curriculum.

Curriculum does not exist in a vacuum, it occurs within the larger framework of the learner situation and of the instructional given by the game in given situations.

The game as a Self-Reflective System (AI?). Here as noted that the learning analytic can be an input and spur as it determines what content not to teach and what methods not to use by the game - within that context or audience. As in normal curriculum development - more typically, as players (learners) apply to the system (course/program) their new knowledge and skills, new issues and question often arise - this calls for further curriculum development.

Here it's more important that it is easy to adjust, modify the content and activities - the system/games will be in open source code for update and further development by others who is interested.

# Potential with IL games

## Examples of input to Learning Analytics

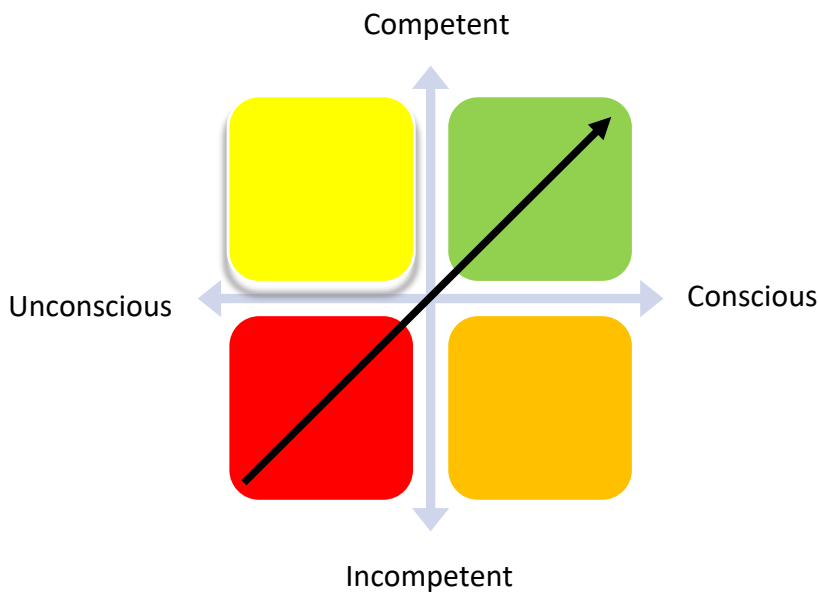
If the learner/student have to input action both before and in the activity the learning analytic system with scores and leaderboards can identify the learners further needs for better adapted learning. But also indicate for us about the content quality and level of comprehensibility.

### Do you know the answer?



Figure 7 : Example - Input from the learner to the game

Other input for learning analytics can be overall progress, solved issues/question counts, time spent and *awareness* as above example (green, yellow, orange or red). The direction for the learning is positive when the student goes from red to green area of state/situation in the game.



Figures 8-9: Awareness analysis models

Indicators:

- Unconsciously Incompetent
- Consciously Incompetent
- Unconsciously Competent
- Consciously Competent

This example of analytic model is inspired by Area9 Lyseum<sup>38</sup>. They have this as the adapted learning analytic model for their learning platform.

<sup>38</sup> <https://area9lyceum.com/>

# Equitable IL game-based model

The ADDIE model in combination with competence-Based learning approach can be the framework and starting point as the Analysis in the proposed work for Outcome 3.

Common development practices and approaches are prototypical software development life cycle (SDLC) and Analysis, Design, Development, Implementation and Evaluation (ADDIE).

ADDIE is used more for design of adult learning solutions. Productions fields are technology, the dramatic arts and instructional design - a cross disciplinary approach, building high engaging experiences. The process and documentation are iterative.

Often used steps is initiation, preproduction, production and postproduction as the preliminary phases - but overlapped by SDLC.

Game/Stage Production	SDLC - Software	ADDIE - Games
Development	Definition Requirements	Analysis
Preproduction	Analysis Design	Analysis Design
Production	Prototype Build Test	Design Development Evaluation
Postproduction	Revisions Final testing	Evaluation Implementation
Go Live	Deploy/kickoff Debrief	Implementation Analysis

Table 16: Modified table for Game Production and Milestones across Methodologies<sup>39</sup>

Based on literature review and our experience as university teachers the ADDIE model can be one of the selected as a starting point for NAVIGATE as a relevant course design model. It's 5-step: Analysis, Design, Development, Implementation, Evaluation (Figure 1) in combination with a design thinking approach (for better user understanding), competence-based learning (for defining the learning activities, evaluation and outcomes, Figure 2) and gamification of the learning process corresponding to the learning goals.

The learning goals in based on the selected and prioritized skills and competencies chosen from the Competency tree Framework to be included in the game.

<sup>39</sup> Palmer, Charles. & Petroski, Andy. (2016). *Alternate reality games: gamification for performance*. Boca Raton: CRC Press - ISBN: 978-1-4987-2238-4

Learning Outcomes can be stipulated via Competency tree Framework, more specified by a Revised Bloom’s Taxonomy<sup>40</sup> using more detailed adverbs in the design stage, for those who play the game understandable. It’s must be highly important that the target group for the game understand it easily and know which games activities give the competencies related to the Competency tree Framework.



Figure 10. ADDIE 5-step course design model

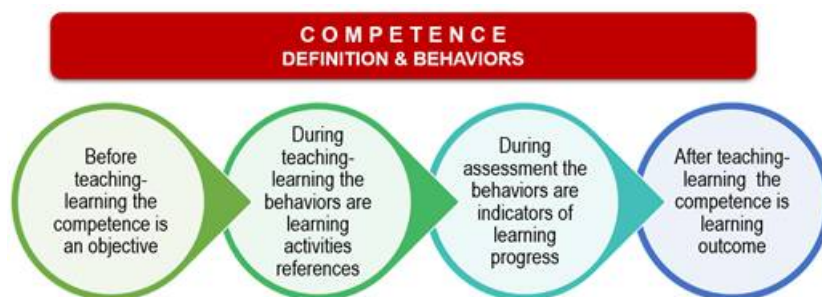


Figure 11. Competence-Based learning approach

As a part of the Analysis part of the ADDIE-model. The Analysis from the survey O2 A1 and the Elaboration of a concept of IL integration into BA Curricula with Syllabus definition will give hand that we can use the results of NAVIGATE survey. We can start the Analysis from the competencies gap. Note also the essential components of competency-based pedagogy<sup>41</sup> - definitions and behaviors in the figure above.

<sup>40</sup> Revised Bloom’s Taxonomy by Center for Excellence in Learning and Teaching, Iowa State University URL: <http://www.celt.iastate.edu/teaching/effective-teaching-practices/revised-blooms-taxonomy/>

<sup>41</sup> URL: Example and seven goals and the essential components of competency-based pedagogy: <https://teachonline.ca/pockets-innovation/designing-and-developing-student-centered-competency-based-online-learning-la-cite-ottawa-ontario>

The gap can for the prototype and O3 be described as two important gaps, to take a position to prioritize which competencies with activities the game should (learning modules) contain:

1. Gap in the game-market. Here we can draw the conclusions of what is missing in the relevant games (the 20 games that we examined and assessed more closely).
2. The most vital competencies we in the NAVIGATE-project find would give the most for the humanities students to improve their study results regarding avoiding false content in their student work (focus of the project goals).

The balance between these two gaps – as well as what is also possible within the project timeframe needs further discussion to prioritize the planning of O3 and design of the games (in ADDIE terms). The development and implementation (in ADDIE terms) is as well as prototyping is part of the O3 in this project.

***Example for further discussion regarding design and the assessment - whether the student has completed an activity.***

#### **Basic and Independent - learners level**

NAVIGATE could choose to describe the competencies gap and levels using EUROPASS levels adding Fail and limiting to first two levels *Basic* and *Independent*<sup>42</sup>.

Table 1: can be used to be a part for the further planning for the modules /games and as suggested rubrics of NAVIGATE Information Literacy Game-based model.

#### **Instructional method - a view to engage the learning to game activity**

Gagne's 9 Events of Instruction<sup>43</sup> - can be discussed as proposed and usable model of Instruction for the games and learners.

*"Gagne's book, The Conditions of Learning, first published in 1965, identified the mental conditions for learning. These were based on the information processing model of the mental events that occur when adults are presented with various stimuli. Gagne created a nine-step process called the events of instruction, which correlate to and address the conditions of learning."*

Gagne's Nine Events of Instruction as following:

1. Gain attention
2. Inform learners of objectives (here describe the skills and competencies in the Competency tree Framework)
3. Stimulate recall of prior learning

---

<sup>42</sup> Table 1: Proposed, Analysis model URL: [https://docs.google.com/document/d/1r66trPK0cgTWL-BJM9UTPd4vTOARjvP\\_gFjLW8da3w/edit#heading=h.fbw8mfpmfl7](https://docs.google.com/document/d/1r66trPK0cgTWL-BJM9UTPd4vTOARjvP_gFjLW8da3w/edit#heading=h.fbw8mfpmfl7)

<sup>43</sup> Mars 13th, 2018 - Tool Types: Pedagogy - citation from UF Center for Instructional Technology & Training - Information Technolgy - University of Florida. Gagne's 9 Events of Instruction URL: <http://citt.ufl.edu/tools/gagnes-9-events-of-instruction/> (2018-12-04)

4. Present the content
5. Provide "learning guidance"
6. Elicit performance (practice)
7. Provide feedback
8. Assess performance
9. Enhance retention and transfer to the job

### Workflow for framework in ADDIE approach for Game Module Development

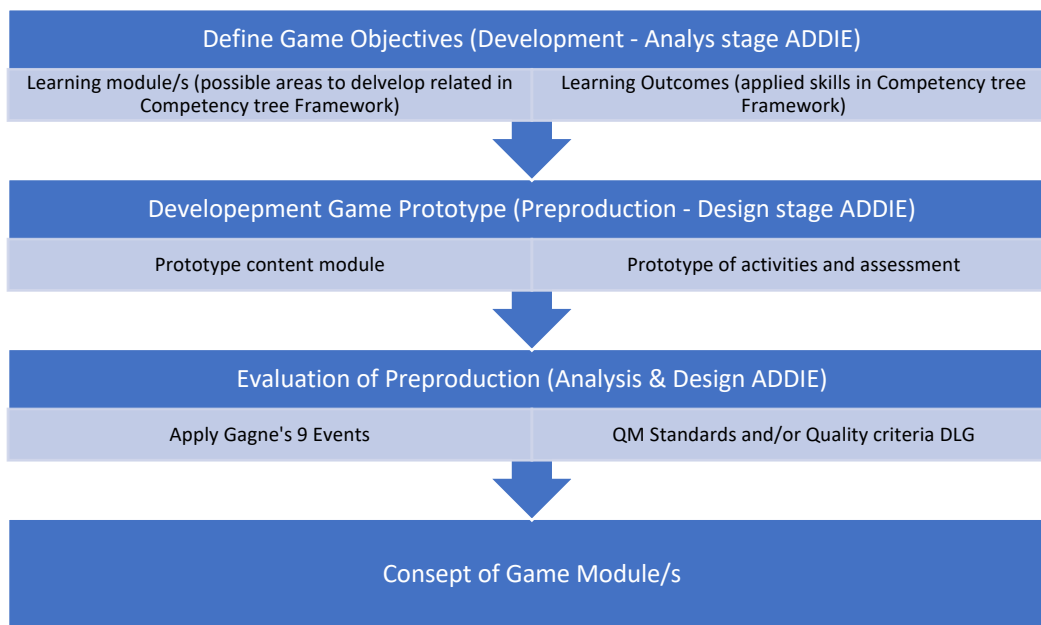


Figure 12: Workflow - O3 with ADDIE approach for Game Module Development

### Instructional Design with 4CID<sup>44</sup>

Another model for instructional Design is 4CID. It is based on Merrill's first principle of instruction. The five principles of instruction (Merrill, 2006):

- **The demonstration principle:** Learning is promoted when learners observe a demonstration
- **The application principle:** Learning is promoted when learners apply the new knowledge
- **The activation principle:** Learning is promoted when learners activate prior knowledge or experience

---

<sup>44</sup> URL: [http://www.ciencias.ucr.ac.cr/sites/default/files/Merrinboer-four\\_component\\_instructional\\_design.pdf](http://www.ciencias.ucr.ac.cr/sites/default/files/Merrinboer-four_component_instructional_design.pdf) and [https://platform.europeanmoocs.eu/users/71/Multimediabook\\_2ndEd\\_FINAL.pdf](https://platform.europeanmoocs.eu/users/71/Multimediabook_2ndEd_FINAL.pdf)

- **The integration principle:** Learning is promoted when learners integrate their new knowledge into their everyday world
- **The task-centered principle:** Learning is promoted when learners engage in a task-centered instructional strategy

The Four-Component Instructional Design (4C/ID)<sup>45</sup> model claims that four components are necessary to realize complex learning:

1. learning tasks,
2. supportive information,
3. procedural information, and
4. part-task practice.

The 4C/ID design model is extended with the four components are described in detail in Merrienboer (2002) and from which this picture<sup>46</sup> is taken:

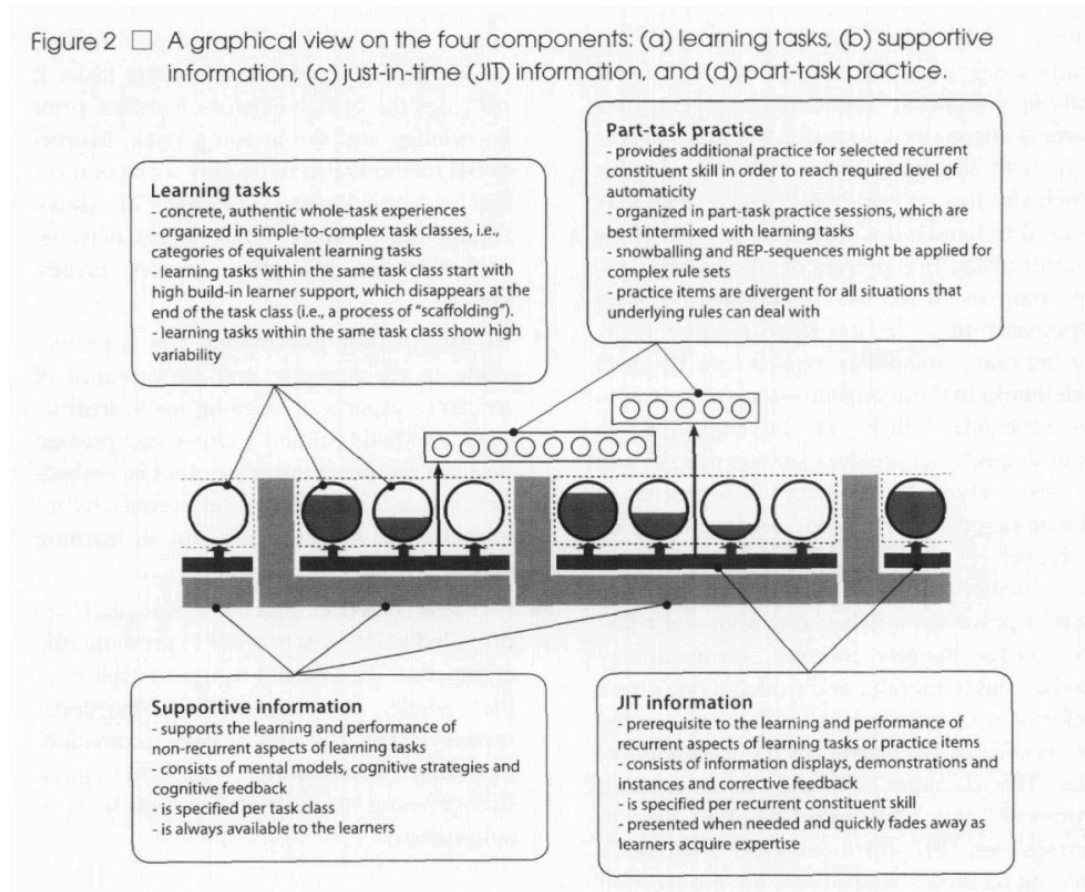


Figure 13: 4C/ID design model - A schematic overview of the four components in the 4C/ID-model and their main elements.

<sup>45</sup> URL: <http://web.cortland.edu/frieda/id/IDtheories/8.html>

<sup>46</sup> URL: <http://edutechwiki.unige.ch/en/4C-ID>

In “Game design for complex skills” (Faber et al, 2018)<sup>47</sup> illustrate via an emergency care game for medical students that applying 4C/ID to serious games have following options via this table/matrix (modified for a Game-based learning generic model):

	<b>Learning tasks</b>	<b>Supportive information</b>	<b>Procedural information</b>	<b>Part-task practice</b>
Do’s	Authentic, varying tasks Task into context Increase complexity with levels Gradually decrease support	Provide BEFORE a new level Keep available Tailor to player’s performance Help to make sense of the context	Present information on recurrent skills (just-in-time) Create chance to apply new know-how	Use for skills requiring automation Stage a part-task in the context of a learning task (extended micro-learning module)
Don’ts	Start too simple - deliver challenge! Present tasks out of context	Provide support players don’t need	Explain tools that aren’t needed soon Fail to give information when needed for progression	Present a part-task as discrete set of skills
Options	Quests Levels Tutorials Screencasts or simulation of expert play as worked out example	Brief the player on the settings On-demand reference material (online guide module, Libguide) Clear objectives and progress Leverage user communities for context information	Make learning object respond to interaction Virtual agents can give advice Explain new tools or content when available	Create related sub-goal that calls for repetitive practice Blended approach with librarian or instructor
Our choices	More cases Level based on complexity Time-base for interventions	Pause function, to reflect/seek help Structured assessment	Tools explain themselves Highlight where to use a tool When you do something stupid the guide will guidance you	Do we find any indications of part-task practice in the games?

Table 17: Matrix - applying 4C/ID to serious games

<sup>47</sup> Faber, Tjitske & Van Merriënboer, Jeroen J. G. & Dankbaar, M. (2018). Game design for complex skills. 10.13140/RG.2.2.23286.24649. URL: [https://www.researchgate.net/publication/329528490\\_Game\\_design\\_for\\_complex\\_skills](https://www.researchgate.net/publication/329528490_Game_design_for_complex_skills) and



### ADDIE vs. AGILE Model

There are several<sup>48</sup> instructional Design models and a comparison with ADDIE and standard AGILE working model is therefore good to show, as follows<sup>49</sup>:

	ADDIE Model	AGILE Model
<b>Acronym breakdown</b>	Analysis Design Development Implementation - Evaluation	Align Get set Iterate & implement Leverage - Evaluate
<b>Comparison of models</b>	<b>Content-centered:</b> Focus is on creating measurable objectives with outcomes and activities that are in alignment. <b>Linear:</b> moving from one step to next without evaluating as you go along creates longer production times. While it's an iterative process, it occurs once the project is done which can be costlier.	<b>Learner-centered:</b> Focus is on the learner and how they engage and interact with the content. <b>Non-linear:</b> an adaptable approach allowing for collaboration, flexibility, and revising throughout. Equates to more cost savings since the revisions are embedded in the 3rd phase (iterate & implement).

Table 18: ADDIE Model vs. AGILE Model

***Question/Reflection: For us in this project, it can probably be an advantage to mix ADDIE with an agile approach.***

### What is “competence” in IL competence - definition

Competence means in Swedish term/common context? We have a SIS-standard for this. In Swedish management systems (SIS) for skills Supply-SS 62 40 70. The following definition is available regarding the concept of competence:

SIS has defined the concept of competence as "ability and willingness to perform a task by applying knowledge and skills" where the following meanings have been put behind the words:

- Ability experience, understanding and judgement to translate knowledge and skills.
- Want attitude, commitment, courage and responsibility.
- Knowledge facts, methods – to know.
- Skills to perform in practice – to do.

<sup>48</sup> URL: <https://www.shiftelearning.com/blog/top-instructional-design-models-explained> and <https://www.iddblog.org/?p=2334>

<sup>49</sup> <https://www.iddblog.org/?p=2184>

### Model when to use the IL-game - conceptual Take-off Point

Here shown what competence level via SIS, categories and action verbs in context of type of play.

Optimal Use Case	Performance Objective Alignment	Improved skills (examples, adverbs) Bloom's Taxonomy Action Verbs <sup>50</sup>	Type of Play
Free	Comprehension as Ability experience, understanding and judgement to translate knowledge and skills.	Select Compare Judge	Individual
Library Led	Knowledge as Knowledge facts, methods – to know.	Disprove Prioritize Organize	Competitive
Instructor Led	Knowledge as Skills to perform in practice – to do	Solve Recommend Combine	Collaborative

Table 19: Examples of conceptual Take-off Point for use, performance, improved skills and type of play

### The Game structure and assessment - E-Design Assessment Tool

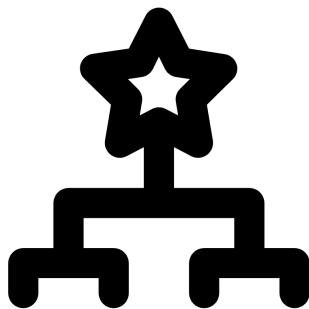


Figure 14: The game is a part of game structure with assessment - in context with other assessments

### E-Design Assessment Tool - a way to see the game in the assessment context

The E-Design Assessment Tool<sup>51</sup> - Tutors/Teachers and librarians' instructions - can add activities below and indicate where the games have specifically included interaction and/or

<sup>50</sup> URL: [https://www.missouristate.edu/assets/fctl/Blooms\\_Taxonomy\\_Action\\_Verbs.pdf](https://www.missouristate.edu/assets/fctl/Blooms_Taxonomy_Action_Verbs.pdf) and [https://www.apu.edu/live\\_data/files/333/blooms\\_taxonomy\\_action\\_verbs.pdf](https://www.apu.edu/live_data/files/333/blooms_taxonomy_action_verbs.pdf)

<sup>51</sup> URL: <https://journal.alt.ac.uk/index.php/rlt/article/view/2106/2474> and eDAT evaluation download kit/calculator <https://blogs.staffs.ac.uk/bestpracticemodels/edat/> and video here <https://altc.alt.ac.uk/2017/sessions/using-the-edat-e-design-assessment-tool-to-analyse-online-learning-designs-1846/#gref> and thesis here [http://eprints.staffs.ac.uk/4746/1/Walmsley-SmithH\\_EdD%20thesis.pdf](http://eprints.staffs.ac.uk/4746/1/Walmsley-SmithH_EdD%20thesis.pdf)

feedback activities. When calculate the % of each activity type to helps the course designer reflect on the learning design. Here can retention and attainment rates also be a part to evaluate the quality of the learning design. The E-Design assessment Tool (e-DAT) - is one of several evidence-informed approaches. This toward a consistent terminology for quantifying the (online distance) learning activities.

Assessment type/and activity	Interaction with...	Feedback from...	Other content or activities
	A. tutor B. peers C. (interactive) content D. GAME	1. tutor 2. peers 3. self 4. computer (automatic) 5. GAME	✓
Activity text here ...	[add interaction type here if present in activity]	[add feedback type here if present in activity]	
[Insert additional rows as required]			
<b>Total activities: __</b>	<b>_% with interaction</b>	<b>_% with feedback</b>	<b>_% other</b>

Table 20: Modified with a GAME - The E-Design Assessment Tool

### Assessment types and Assessment techniques

We have three types of Learning Assessment (Stec, E., 2004)<sup>52</sup> to note for the games:

- Prescriptive or diagnostic
- Formative
- Summative

There are different assessment techniques and methods to guide and support students throughout the information literacy learning process. Here are some of the primary and generic tools:

- Checklists
- Rubrics
- Conferencing (with others or with the game system)
- Portfolio
- Test
- Reports

**The game could include** checklists, rubrics, test, leaderboard (as portfolio) and conferencing - here proposed as using questions posed by the game (virtual facilitator) inquiring about the process of learning. See also the part in this document regarding Potential with IL games - Examples of input to Learning Analytics. Here the conferencing question in diagnostic stage is, how the students' situation of *awareness* is before the answer or action is done.

<sup>52</sup> URL: <https://www.ifla.org/files/assets/information-literacy/publications/ifla-guidelines-en.pdf>