

*Literacy21* is a gamified software application to assist the teaching of literacy to students with trisomy 21 (Down Syndrome - DS). Gamification is intended to add entertaining and fun to the app to motivate longer engagement by players.

*Literacy21* architecture is composed of two basic modules: one for the player and another (the “supervisor module”) for the therapist, teacher, instructor or parents who may prepare material, guide and supervise players’ activities. The player module is to execute on mobile devices and on desktop machines connected to the Web and serves the purpose of studying gamified lessons and doing work such as responding to drills, assignments, homework and missions. Work may be done alone, by a group of players or under the supervision of parents or instructors. Missions may be carried out online, in the real world or both (alternate reality). Successfully finished work leads to merit points and rewards for the player. The supervisor module runs on the Web and assists the user to prepare lessons, check assigned work, define missions and monitor players’ performance.

One may argue that requirements for games or software on DS are not much different from those implemented for games or educational software in general. Some requirements are generic indeed, and apply to many software – such as user login authentication. These are not of interest here, nor are requirements that pertain to literacy lesson content specifics which may vary according to teaching objectives, teaching processes and the language being taught. The software requirements we want to elicit here are those that highlight differences one should consider for the advantage of a DS audience. Differences may be subtle sometimes, but requirements for a generic game or software and those for *Literacy21* do indeed, differ. In regular game mechanics, for instance, the player is usually penalized for not finishing a certain task (spelling a word, say) after a certain number of trials or within a time limit; depending on the context, the player may even be chastised with flashing messages on the screen, rude music and verbal scolding. It is not to be so in the case of a DS context: there should be no limits on time or on trials, in fact the mechanics should coax players to get it right eventually, provide frequent feedback and congratulate them on their success.

It is intended that the final set of requirements for *Literacy21* will serve as a reference for the design of gamified software for teaching Portuguese literacy to DS individuals, providing developers with a base to define a road map for software versioning in terms of which requirements to include in a new version given their importance in terms of usefulness for DS players and professionals and the effort to code them.

An initial set of 75 requirements for *Literacy21* was elicited from an ongoing review of the specialized literature on DS and Software Engineering (requirements engineering aspects), analysis of some available educational software and games for DS and from professionals working with DS individuals. These mostly non-functional 75 requirements are classified into 8 categories as given in Table 1.

Table 1 – Initial categories of requirements for *Literacy21*

Category	Total initial requirements	Example requirements
Navigation & Interface	31	Screen-related features, such as buttons (big, dark colored with lighter color lettering), images (photographs preferable to drawings), colors (should be bright) and fonts (Serif)
Gamification elements & Incentives	11	Alternate reality gaming, support for avatar and game currency, integration with other online and physical board games, trust and reward systems, creation and management of tangible and intangible incentives, and, of leaderboards
Game mechanics & System configuration	11	Repetition, duration and other rules concerning activities and rewards and configuration of user profiles and privileges
Authoring	8	Specification of tools to assist developers of multimedia material (lessons, tasks, missions) for players and supervisors by instructors and other professionals
Tools & Support for supervisors	5	Facilities to assist supervisors (therapists, instructors...) in managing the learning process with player performance metrics, customization of tasks for specific players and granting of rewards
Feedback & Help	5	Support for multimedia interactions with the players and alerts and reminders of pending assignments, praise upon successful completion of a task or parts of it, (frequent) positive feedback and stimulating corrective recommendations; responses to help requests
Input	3	Guidelines for usage of mouse, keyboard (both to be and touch screen (preferable) by players
Socialization	2	Requirements to support players' interactions with the persons anchoring the presentation of material in lessons or interactions with other players within the app itself so that they may chat, do group work, barter, exchange gifts or buy goods using points

Please note that the categories and their requirements in Table 1 will change as elicitation from several sources continues and validation experiments are carried out.

Preliminary efforts are being made to validate and determine the relative importance of the initial set of categories-requirements in Table 1 through semi structured interviews with DS individuals, DS family members, DS specialists, psychologists and DS instructors in Brazil and in Australia. For that we ask that you answer the following questionnaire.

## *Literacy21*

### Questionnaire for Preliminary Validation of Initial Requirements

**Your age and sex:**

**Highest school degree:**

**Expertise area:**

**Years of experience with DS:**

### Questions

1) Is there a category of requirements you want to add to Table 1? If yes, please describe it briefly giving examples of some of its requirements.

2) Would you remove any category from Table 1? If yes, which one(s) and why?

3) Regardless of categories, is there an important requirement you want included in a final set of requirements?

4) Do you think the categories of requirements in Table 1 for a gamified software for teaching literacy to persons with DS will be useful for players and supervisors by facilitate learning and teaching?

5) Please rank the 8 categories in Table 1 in descending order of importance. You may want to rank two or more categories with the same importance. An example rank would be:

1- Navigation & Interface + Tools & Support for supervisors

2- Feedback & Help

3- Game mechanics & System configuration

...

8- Socialization

NOTE: Please include in your rank any new categories or loose requirements you add.