Karaton: an example of AI integration within a literacy app

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Context

- Erasmus+ project
- Partners: Belgium-Flanders, Czech Republic, The Netherlands, United Kingdom
- 36 months (September 2018 - August 2021)
- Aim: improving reading fluency of struggling readers throughout Europe using innovative teaching practices based on digital opportunities
 - In-depth stakeholder needs analysis
 - Inventory and critical appraisal of existing reading fluency apps
 - Experimental test and qualitative evaluation of selected reading fluency apps
 - Toolkit for teachers
 - IT literacy curriculum for struggling readers (10-11 years old)
 - Recommendations for teachers and parents, for national and European educational policymakers and for app developers

Development of Karaton - Requirements

- The tool should be based on recent scientific evidence;
- Adults wanted to be able to see the progress of the children and
- The tool had to be motivating and fun to play.

Games based exercises

- Every mini-game built for the various strategies had extensive user testing with children to ensure the goal for each game was clear, with as few instructions as possible.
- Different levels and types of games presented on successful completion or other games with similar content if more practice is required.

Games about building not drill and testing

- The mini-games are 'chopping wood' and 'sawing wood' to exercise splitting words in syllables,
- 'cleaving rocks' and 'ore oven' to exercise word recognition,
- 'lianes' and 'binding lianes' to practice flash word reading and
- the 'dodo-race' and 'balancing duel' to practice spelling.

Personalisation is paramount

- Decision-tree model based on logged progress and feedback
- Over 4 months 35 students and 8 teachers provided sufficient data to allow teachers to see progress and customise strategies for next steps.
- Use of Artificial Intelligence (AI) for personalisation with more data and predictive models.

ANN (Artificial Neural Network) based machine learning

- The progress data, based on users' personalised information (e.g. reading level), the difficulty level of each mini-game associated with reading exercises, users' response times and game scores is normalised to feed into the proposed ANN model.
- To date 50 levels are defined, based on several aspects of the word that are presented in the exercises such as
 - number of syllables,
 - syllable length
 - phonemic structure (CV, VC, CVC, CCVC, CVCC, ...) and
 - morphological structure of the word (composition, prefixes, suffixes),...

Results

- AI using machine learning can:
 - offer a more detailed analysis of the particular words (and letters) that have been found to be incorrectly read.
 - create a personalised word list that is more specific to the needs of the child.
 - capture mistakes and integrate words that use mistaken letters into the next exercise level, so they can be repeated
 - detect different combinations and provide useful information to teachers and other educational professionals

Potential Outcomes

- An assessment tool for individual reading strategies and their particular effectiveness for each child
- Improved support at a more targeted level, whilst increasing the effectiveness of the training offered.
- Allows professionals easier detection of reading skill variations at an early stage
- More time can be spent on specific difficulties using hands on interventions or instruction.
- Designers would receive enhanced feedback for the next stage of the app development.
- More individualised exercises or mini-games could be added where needed

What we have learnt...

- There is a balance between
 - instruction and degree of effort required to complete a game - one of the hardest tasks in the design process.
 - how much the use of AI could influence the games' internal economy
 - resources gained versus spent and support for literacy difficulties, whilst providing a confidence boost for players.

More
information?

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