

of those smaller types of minigames in one of the larger games, the idea would also work on its own. An idea in this type of easy learning and practicing game came from the fact that Finnish and Karelian are very closed, especially in Viena

Karelian dialect there exist several similar words than in Finnish. Likewise, some words can be similar, but the meaning is different. In this type of concept, a player can learn and practise which are the same in both and which different.

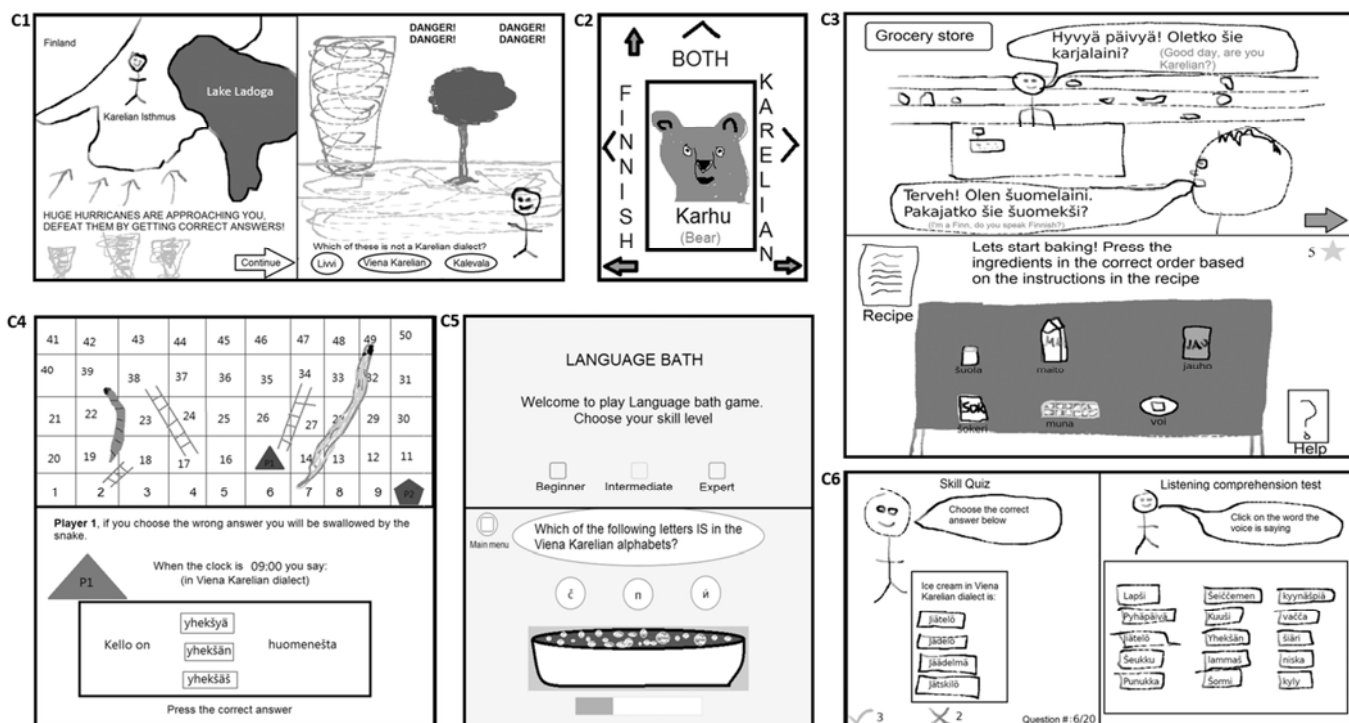


Fig. 5. Concepts: C1) Threat in Karelia, C2) Karelian or Finnish? C3) Karelian pies, C4) Ladder to Viena Karelian, C5) Language bath, and C6) Test and Practice Viena Karelian

TABLE III. SUMMARIZATION OF THE GAME CONCEPTS

Concept	C1	C2	C3	C4	C5	C6
Platform	PC, smart device	Mobile	PC, smart device, card, board	PC, smart device, board	PC, smart device	PC, smart device
Idea	Defending Karelian region by completing language learning tasks	Various words with pictures shown to player, swipe direction of the language	Story game with different kind of real-life situations, Karelian language used	Throwing dice to run to the end of the game, language tasks to prevent going back or moving forward	Teaching language via gamified elements and visual effects where the bathtub is the "teacher"	Gamified elements with some cultural aspects like game guide to help and support the player
Characters	Player	Player	Player, Shopkeeper, bus driver	Players as buttons	Player	Player
Starting	Karelian culture presented then suddenly threat appears	Different themes for, word and picture appear on the screen	Player character is home and has guests arriving, wants to offer pies	Square 1, player rolls dice and moves	Choosing level and then starting to learn via tasks	Starting quiz to test the knowledge of the player
Goal	Teaching Karelian culture and language in a fun way by protecting earth	Teaching vocabulary by theme in a simple manner, to complete all themes fully	Go to town and buy materials to make Karelian pies all in Viena Karelian	Reaching square 50 before another player does	Going through all the language learning tasks available	Progressing through the game to learn broadly about Karelian language
Context	Modern day Karelian region with unnatural elements	Themes of food, dates, animals, basic sayings	Karelian region in a time without smartphones	Can be adapted according to different themes	Can be adapted according to different themes	Can be adapted according to different themes
Players	1	1	1 / 2+	2 / 2+	1	1
User group	All	All	12+ years for solo, All for multi	All	All	All
Game mechanics	Levels, stars, badges, 3D map, character	Themes, progress tracking	Character, levels, virtual scenarios	Minigames, task success tracking	Levels, progress tracking, feedback, help	Audio recordings, progress tracking, levels, feedback, help

3) *C3: Karelian pies*. is a concept where player creates their own character and then they need to go to town/village to buy ingredients for the recipe of Karelian pies. The main way of teaching things in the game would be through conversation in the shop with the seller (Fig. 5, C3: above) and with different kinds of people while in the process of making the Karelian pies at home (Fig. 5, C3: below). The game is fit for all age groups and the process of making the actual food does not require any knowledge on how to make them. The possibility to form this game into a board game where all the story options are on cards and there can be two players, one acting as the shopkeeper and other one acting as the player. In the baking phase of the game the other player can guide the player with the instructions as they place the ingredient cards on the table in the correct order. When used in live version the conversational elements and pronunciation are more highlighted. This type of game would also teach about the food culture.

4) *C4: Ladder to Viena Karelian* concept comes from the old snakes and ladders type of game where two players go head to head on a board, throwing dice until other one gets to the goal. Ladders on the way let players get up multiple rows or snakes can “eat” the player to make them fall down several ranks (Fig. 5, C4: above). Whenever a player lands on a ladder or a snake they are given a task, a word, a sentence or something else to translate or change one word to make it correct (Fig. 5, C4: below). The fact that another player is needed makes it easier to be played on a browser as there it can be player from tablet, smartphone, laptop or PC. This type of concept could be visualized also by using culture specific elements, for instance, ladders and snakes could be replaced with issues relating to nature, animals or hunting. For instance, a player could pick berries or mushrooms and then avoid facing bears.

5) *C5: Language bath* is a concept where different kinds of language related questions pop up from the bathtub. The game starts from the most basic form of letters and is in a form of quiz, trying to teach the difference between Finnish language and Viena Karelian (Fig. 5, C5: below). The users are first prompted to select their skill level and depending on the level the questions will be harder (Fig. 5, C5: above). The progression is done with levels and the possibility to advance to a harder level requires completing the easier ones first with the option to skip straight to the harder ones in case harder ones are wanted to try. It would be easy to create variations from this type of concept. For instance, the element from where the words pop up could be visualized relating to contexts what themes player is learning. The bathtub could be used when practicing words or sentences relating to washing. Likewise, an iron pot could be used when learning words of cooking. Changing the visual elements according the themes or in different levels of difficulty could increase players’ interest and make the game to be more entertaining and fun.

6) *C6: Test and Practice Viena Karelian* is a concept where users skills could be tested at the beginning of the gameplay, and then series of vocabulary quizzes would be presented to the player. The game would have audio files that

complement the learning. The Fig. 5 shows an example, where is a quiz to test the knowledge of the user with four answers to choose from, counters of correct and wrong answers at the bottom (Fig. 5, C6: left). In the example of testing listening skills (Fig. 5, C6: right) a player clicks the answers that are read aloud by native Karelian speaker. One idea in this type of concept is that the player can learn and test own progress easily with the same application. It is easy to increase a level of difficulty by adding variations of themes and sentence examples.

B. Design recommendations

The language learning game for minority learning should be made to be available for everyone easily. The easiest way for this, is to have the game available on the internet instead of having it as a board game sold offline. The game should not either be only found as an application for smartphones as it might limit some user groups from reaching it. It is important to provide several ways to access to the different games.

Designing the game for multiple languages can be hard depending on the level of the game and if cultural context is present, the difficulty increases plentiful. Cultural context is important when designing the game, because it gives players added motivation to learn the language. Using songs, folk lore or history when presenting the culture gives the players something to look at and listen and refer to when learning the vocabulary and pronunciation.

Feedback and achievements are very important in the light of motivation. Keeping the player’s motivation up throughout the playing process is important and using badges, stars and positive feedback are one of the easiest implementations for this in game. There is no such thing as too much of these if they have clear intent and are correctly implemented. One example of a wrong implementation would be if the player needs to click and acknowledge each star after each answer. Correct way for this is to just flash the star for the user and then have it in the corner of the game area to remind them that they are doing well.

Based on the findings of this study the following design recommendations are proposed:

Player aspects

- 1) Pay attention to the age of the user group, if the game is for children, adults or everyone. In minority language context, it is important to develop games for all age groups (e.g. C1-C6).
- 2) Aim to motivate a player as much as possible with achievements, badges and instant feedback [3]. Create games the way that they increase motivation to learn and minority languages.
- 3) Aim to have some form of social element in the game, either by increasing the player count, by adding a scoreboard or sharing results. (as a limit in [41]) One option is to provide a possibility to have conversation with other minority language speakers.
- 4) Aim to have some type of player character so the player can feel more immersed, preferably unisex

model [41]. One option is to create characters that relate to culture and history of minority language.

- 5) Involve citizens of minority language users (new learners, advanced and proficient) into design and evaluation processes.

Learning aspects

- 6) Pay attention to what is the learning purpose of the game, if it is meant to teach vocabulary, pronunciation, grammar, culture or perhaps all of them. (e.g. G3, G6, G9 and C3).
- 7) Pay attention to adaptability for other minority languages or different dialects of the same minority language. [33] Finding a good game solution for one minority language and adapt it to other minority languages could help the challenges with the limited resource, monetary and technological issues [14].
- 8) Aim to have repetition and reappearance of the words when learning simple things like vocabulary to test and assure that the words are fully learned. One option is to provide variations of games, for instance, using crosswords, word soup and different selection games (e.g. G1-G9 and C1-C6).
- 9) Use themes for helping a user to perceive the vocabulary into one group to simplify learning. (e.g. G1-4, G7-G9 and C1-C6)
- 10) Avoid scenarios where the game asks too much too quickly from the user, such as after learning a word they are required to use that in a sentence (Example of the third version of G3). Ensure that vocabulary and grammar are learned well before asking a player to use them. Another solution could be that the game helps a user to form the correct sentence or grammar tasks could be showed only when a player has reached the certain game level.
- 11) Aim to have the game in a linear manner (as in [34]).
- 12) Aim to let a user has access to already learned parts of the game, so that they can test their learned skills and to iterate words.
- 13) Involve native speakers and teachers into design and development process of minority language learning games.

Platform aspects

- 14) Pay attention to the platform for the game, if it is mobile application, on the web or possibly a board game, for example, children were more excited about mobile applications. [22] In minority language context, it is important to provide several ways to play learning games, because people may not have the same technical resources to access the games. Also, families could play board game together and thus share to knowledge of minority language between family members.
- 15) Try to find digital platforms for games to be used by minority language communities from different locations (e.g. from different country or dialect areas)

- 16) Pay attention to the usability aspects on different platforms when designing multiplatform games on the web, for example the size of the pictures should be scaled properly. (Was found as a problem in G1 & G4)

Design aspects (usability & user experience)

- 17) Use clear pictures where a user can easily distinguish one thing from another, for example separating sugar from salt.
- 18) Use audio-visual elements to help a user to learn vocabulary, for example audio clip associated to a word. [32]
- 19) Avoid too quick elements in the game, for example feedback or answer should not just disappear after X amount of time. (Found as issues in G5, G6)
- 20) Create several variations of the same concept and evaluate their weaknesses and strengths.
- 21) Develop clear instructions on how the game work and present them to a user before playing and add extra guidance when the user is stuck. [26]
- 22) Avoid too complicated games that require excessive learning time of the game, the users should get accustomed to the game quickly and easily. [41]

V. DISCUSSION

This paper presents findings from the evaluations conducted for popular language learning games and especially for games developed for Karelian language, which has a status of endangered minority language [17]. During the evaluation several usability and user experience issues were found because these games have developed for research purposes [40] or they are in their early stage [18][19][20][21]. However, we regarded sharing these findings as important in order to rouse discussion and interests to a need for developing digital solutions, for instance, games or gamified applications for learning and maintaining, and thus revitalizing minority languages. Taking into account limits of resources, monetary capitals and technological capabilities [14], ideal is to find solutions that could be applied for several minority languages. We acknowledge that our game concepts and design recommendations require more studies and evaluations. Even though, there exist several guidelines or heuristics for game developed, we noticed that there is a lack of guidelines targeted especially for game development in minority language learning context.

VI. CONCLUSION

This paper presents the evaluation findings on language learning games, especially games targeted for minority languages, especially for Karelian language. Based on finding we present new game concepts and propose recommendations for minority language learning game design. These are simplistic guidelines that can help developers in the process of creating new games for minority language learning. During the study we were not able to conduct face-to-face user studies for evaluating game concepts and recommendations because of the covid-19 situation. In the future work, we need to develop concepts and constructions for user evaluation. However, we

regarded sharing these findings as important, because endangered minority languages need designers and developers help and contribution. If we can get academy or industry to find digital solutions for revitalizing some minority language, the solution may could be adapted to several or all minority languages.

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