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LTEC 5610: Critique of *Supporting Struggling Readers with Digital Game-Based Learning*

1. **Reference**:

Ronimus, M., Eklund, K., Pesu, L., & Lyytinen, H. (2019). Supporting struggling readers with digital game-based learning. *Educational Technology Research and Development*, *67*(3), 639–663. doi: 10.1007/s11423-019-09658-3

2. **Purpose of the problem**:

Teaching reading skills and engaging children with moderate to severe dyslexia is a laborious and difficult task. Learning video games can be very engaging for learners. This study investigates how effective the learning game GraphoLearn (GL) is with dyslexic students and the "role of engagement" in their learning processes (Ronimus, Eklund, Pesu, & Lyytinen, 2019)

3. **Literature review/theoretical framework**:

The first literature review section of the paper describes dyslexia research overall. Next, it discusses the research on reading skill development with games. The final section explains the potential benefits learners may get from games. The researchers cite both the positive and shortcomings effects of gaming on learning. Almost all sources cited were written from 2000 onward, within 20 years of the paper's publication date (2019). The researchers state that their study expands upon current research by expanding upon research amongst "children with severe reading disabilities" concerning game-based learning (Ronimus, Eklund, Pesu, & Lyytinen, 2019).

4. **Research Questions and Hypotheses**:

The researchers have two major research questions and three hypotheses:

1. "Does playing GL result in an improvement in reading and spelling skills in struggling readers?" (Ronimus, Eklund, Pesu, & Lyytinen, 2019)
2. "Is engagement during gameplay related to children's performance in GL and learning during the intervention?" (Ronimus, Eklund, Pesu, & Lyytinen, 2019)

Hypotheses:

1. "The children in the GL training group will develop faster in word reading than the children in the control group" (Ronimus, Eklund, Pesu, & Lyytinen, 2019).
2. "If [Hypothesis 1] is true, there is a transfer effect on reading fluency, reading comprehension, and spelling" (Ronimus, Eklund, Pesu, & Lyytinen, 2019).
3. "The development of reading and spelling skills during the intervention period is faster than the development during the follow-up period" (Ronimus, Eklund, Pesu, & Lyytinen, 2019).

5. **Participants (quali)**:

49, first-grade students were recruited from 25 different schools in Finland. These participants selected tested in the 14th percent in word decoding tests. Several students were disqualified during the study, bringing the final sample to "37 children (23 boys, and 14 girls)" (Ronimus, Eklund, Pesu, & Lyytinen, 2019). All students were native Finnish speakers. A background questionnaire filled out by parents attempted to control for parental educational levels.

6. **Research Setting/Context:**

The research took place Finnish cities Helsinki, Espoo, and Vantaa" (Ronimus, Eklund, Pesu, & Lyytinen, 2019). The study took place within a standard school year. The study divided participants into an intervention and a control group. The software package, GraphoLearn (GL), is a freely available reading learning game. Finnish, unlike most languages, has an "almost one-to-one correspondence between the spoken and written language at the level of phonemes and graphemes," making it an easier language to learn to read (Ronimus, Eklund, Pesu, & Lyytinen, 2019).

7. **Method:**

This research is a quantitative experimental study. Participants were divided by school into two groups, a GL intervention group and a control group that received standard reading training. All efforts were made to test if the participants were similar. While testing data may be the best way to determine the improvement in the reading ability of students, qualitative techniques such as interviews may have given more details on the nature of the student engagement with the GL program.

8. **Study Procedures**:

The study began screening for students who scored below the 14th percentile in word decoding tests before the school year started. After participants were selected, students took a pretest in October of the school year. The intervention and the control groups were randomly by the school not by participants to "minimize the potential envy between the children and the teachers' or parents' inclination to give compensatory support to children not selected for the intervention" (Ronimus, Eklund, Pesu, & Lyytinen, 2019. Twelve schools (19 students) were assigned to the GL intervention group, while thirteen schools (20 students) were in the control group. The participants in the intervention group had six weeks of GL training. GL was a supplement to reading lessons, not a replacement. Students in this group would play GL for 50 mins a week in short sessions of 10 minutes. A posttest grade was given the December to both groups. A follow-up study was conducted on the intervention group in March with the intervention group to show if the learning gains made in the study persisted.

9. **Data Collection**:

Several tests were used to measure reading fluency. Participant's word reading skills were tested with a "picture-word matching task selected from a standardized reading achievement test battery," the "standardized reading and spelling test battery: Lukilasse", and the "Finnish version of the Test of Word Reading Efficiency (TOWRE)" (Ronimus, Eklund, Pesu, & Lyytinen, 2019). Spelling ability was measured with the Lukilasse test battery. Reading Fluency was tested with the Woodcock–Johnson III Tests of Achievement. Reading comprehension was measured by a "12-item reading comprehension task" (Ronimus, Eklund, Pesu, & Lyytinen, 2019). These standardized tests seem to be appropriate for measuring reading ability.

Student engagement was measured by an orally administered survey given to the students measuring the emotional engagement and cognitive engagement. Parental and teachers reported their impressions of student engagement with online surveys. Behavioral

engagement was measured by in-game exposure time measured from the game logs. These tests are adequate to measure a narrow definition of engagement.

10. **Data Analysis:**
A Kruskal-Walls test was used to determine if exposure to the program was correlated to parental educational levels. Mixed design ANOVA tests compared the word reading skills of the control group with the intervention group. Separate ANOVA tests were used to compare spelling, reading fluency, and reading comprehension. Where statistically significant differences were seen in the time used with the program, a paired sample T-test was performed to determine if the change in skill was significant. Engagement samples were scored using Pearson correlations. Due to the small sample size of the study, more statistical tests were not available.

11. **Results/Discussion**:
The study found that learning games have statistically significant effects on students with reading disabilities in word-level reading skills. However, there was no transfer effect from the game on "spelling, sentence-level fluency, or reading comprehension" (Ronimus, Eklund, Pesu, & Lyytinen, 2019). Students were able to maintain their gains 3-months after the intervention. Engagement and success in GL were correlated with increases in learning games. Emotional, behavioral, and self-reported engagement, however, was not associated with learning gains. In short, the fun aspects of the game did not necessarily contribute to learning.

The researchers suggest that GL is an effective "supplemental tool for children's reading remediation" (Ronimus, Eklund, Pesu, & Lyytinen, 2019). However, it is not a replacement for traditional reading interventions. The researchers suggest further research into the effects of engagement in games and learning. The researchers point out several limitations to their study. The sample size limited what could be considered statistically significant. Not studying the control group in the follow-up period also was a limitation.

12. **Overall Evaluation:**
Despite not so exciting results, this study seems to be a strong foundation for further research. The study measured a broad range of reading skills with multiple tests and saw how they interrelated. It is also admirable how upfront the researchers were about the non-statistically significant data, and this should help guide future studies. In addition to the limitations of sample size and not studying the control group in the follow-up study, this study could have used more qualitative methods in its measurement of engagement. Further research could focus on how GL effects reading learners in other languages and age groups. Moreover, the research could further explore how different reading learning games affect reading ability.