Use of storytelling to increase engagement and motivation in computing in lower primary schools

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Rationale and related work
Recent work has shown that girls are much less likely than boys to aspire to careers in STEM [2]. Common barriers for girls studying CS include limited role models in the field, a lack of a sense of belonging, and issues of relevance of learning activities. To address some of these barriers, researchers have demonstrated how storytelling approaches are related to other school subjects and how they may be effective for young children. For instance, K-5 research has found close synergies between planning writing in literacy lessons and learning to design digital stories [6]. Whyte et al. [7] found that students aged 9-10 could effectively create digital stories using visual programming tools and that learners were motivated to pursue programming projects independently. In addition, planning and designing digital stories was found to increase the motivation of girls aged 11-15 to engage in programming [5]. Storytelling may be effective for engaging girls in computing, yet storytelling approaches have not been widely investigated for our youngest learners.

Our study and participants
This study investigated how storytelling could be used to engage girls and, more generally, K-2 pupils in computing. We defined storytelling as using narrative to teach computing through digital story-writing and digital storytelling. The study is part of a government-funded research programme comprising of five interventions that has been externally evaluated [4].

To ensure representative coverage, a third-party paid-for marketing campaign was used for recruitment. 60 schools were recruited and 1096 students participated. After data cleaning, data from 346 girls and 326 boys were included (see Figure 1).

Figure 1. Participants
The treatment group teachers completed mandatory online training, structured into three self-directed sessions that included a rationale for the storytelling approach, ScratchJr training, and a walkthrough of lesson plans and resources.

Teaching materials
Quality assured resources were created for the study and used by classroom teachers to deliver 12 one-hour weekly lessons in April-July 2021 (see Figure 2). Teachers in the control group delivered their existing computing curriculum.

Method
External evaluators created a pre- and post-survey based on The Computer Science Attitudes Survey [3]. Adapted for use with K-2 pupils, the survey investigated i) pupils’ attitudes toward computing ii) intention to study computer programming iii) intention to study science and/or maths (see Figure 3).

Figure 3. K-2 computing attitudes survey
The survey was reviewed by a specialist computing teacher, tested with pupils, validated by exploratory multiple-factor-analysis and administered in intervention and control schools. Survey data was analysed using linear and logistic regression.

Qualitative data was collected in three intervention schools. Lesson observations investigated pupil engagement, lesson fidelity, and barriers to lesson delivery. Teacher interviews focused on perceived impact of the intervention. Pupil discussions were also held with four girls and two boys. Qualitative data were analysed using the framework method from Gale et al [1].

Results
Comparing pre-post survey results between intervention and control groups there was no statistically significant difference in changes in student attitudes toward computing or in their stated intention to study computer programming or science and/or maths in future. However, for the intention to further study programming, a small negative treatment effect for boys was observed but this finding should be interpreted cautiously due to sample size and potential teacher influence on survey answers.

Teachers reported that storytelling generally impacted positively on girls’ attitudes toward computing, particularly their enjoyment, confidence, and sense of belonging. Some teachers reported that lessons may have engaged pupils by allowing them to embed their own interests in their stories (e.g. choosing their own characters). They commented that pupils enjoyed being able to choose their own backgrounds and characters which aligns with findings with slightly older students [7].

“[It] gives them something real to work through, so it’s not . . . abstract. . . . they’re able to make it as funny or whatever they want, and it’s also their own interest. [Female pupil name], she dotes on animals, so she’s always having giraffes and all of that, so it’s something that they can make their own connections too . . . I really did like the storytelling.”

Conclusion and next steps
Despite limited attitudinal differences between intervention and control group survey data, the pilot evaluation revealed qualitative data that the intervention design was engaging for pupils and feasible for teachers. In future work, we suggest conducting a larger scale investigation of the storytelling intervention.

References

Figure 2. Lessons created for the study