

Proposal of Field Research Study

Mixed Methods Study Exploring Children's Perceptions of Computational Fluency Using

Scratch

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Background

Today's education phenomenon subjugating many hours in a school day with an exciting and engaging experience aimed at involving today's youth is coding (i.e., programming). Game design, animated storytelling, and animation involving computational fluency is pushing forward and can provide outlets for the emerging and innovative ideology for which our students today will need to understand and compile in the global world. The culmination of thinking and sequential writing appears in many curriculum fields, are now taken the front seat directing to innovative approaches in the classroom. According to Resnick & Robinson (2018). Scratch, a coding platform, provides numerous opportunities which engage and implementing student computational fluency skills in a classroom.

The coding explosion which has created thousands of "apps," websites, online tutorials, webinars, and workshops for introducing and "teaching" the specifics designated with the specialized software platform. Scratch is part of this coding explosion. Scratch is a bit different because of the direction of the coding application toward creating projects, not puzzles (Resnick, & Robinson, 2018). Children start with an idea and turn it into a project which shared with others. The significance and understanding of the logical process of creating an interactive project such as a game, animation or story are crucial to the 21-st Century skill set of computational fluency.

Description of the Study

The purpose of this study is to explore the experiences and interactions of students involved in class activities using the Scratch coding platform. As a learning tool, Scratch essentially engages students in activities which use visual block-based coding to tell a story with animation or in a game-based simulation (Resnick & Robinson, 2102). By "getting things to work" and not "knowing the right answer" undertakes a connection with exploration in science

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and other areas (Papert, 1993, p. 7). Learning and understanding from the students' point of view their flow of ideas, from conception to result, can improve and customize curriculum activities in a classroom. This research study can serve as a special association in the world of education through coding and technology thus linking core curriculum, such as science, and cultivating students' computational fluency skills.

The purpose of this study will address computational fluency using Scratch coding among fifth-grade students. An exploratory sequential design will be applied first to explore qualitatively and then develop context-specific and sensitive quantitative survey that will be tested quantitatively. The first phase of the study will be a qualitative exploration of the knowledge and understanding of what computational fluency represents which will be collected from the small group of participants in a fifth-grade class at an intermediate school in central New Jersey. From the initial exploration, the qualitative findings will be used to develop a survey that will be administered to a larger sample. In the tentatively planned quantitative phase, statements or quotes from the qualitative interviews will be developed into an instrument so that a series of hypotheses can be tested that relate to the participants' understandings and experiences computational fluency through the use of Scratch.

Participants

The participants of this study are fifth-grade students from a heterogeneous class in a suburban New Jersey town. The students range from age ten to eleven years old. All students in this class will be invited to participate in this study. The class size is 23 students. The study will be a purposeful sampling size.

Both Creswell (2015) and Patton (2015) state that purposeful sampling is necessary when a researcher wants to study a particular phenomenon or experience. Patton (2015) reiterates this type of sampling utilizes inquiry approach to enhance the gathering of rich and valuable data for

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the study. Using a purposeful sampling method, the researcher will obtain an understanding of the student experiences when using coding to creative and complete activities. The idea behind a purposeful sampling method is the small number of participants meet a particular criterion provides a rich and in-depth data for the study's phenomenon (Patton, 2012).

The researcher will have to obtain permission for all parties involved including the parent(s) or guardian(s) of the participants, district administration, classroom teacher, principal, and board of education. Participants will be notified about the procedures in the classroom such as video and audio taping, photography, observer, and interviews. Also discussed will be the option to “opt out” of the study. An IRB needs to be completed and submitted for approval. The study can begin once the board has approved the IRB. All signed permissions, important documents, and transcripts will be kept in a secure place. Potential problems could be the time element, “opt-out” rate is high, disapprovals and any changes which will require a resubmitting of IRB.

Research Questions

The purpose of this study is to explore the fifth-grade students understanding and experience of computation fluency through the use of Scratch coding. This study will take place in an intermediate school in a suburban town in Central New Jersey.

- **RQ 1(Qualitative):**
 - How are the learning experiences and concepts of computational fluency established while working on the coding project?
- **RQ2(Quantitative):**
 - What are the computational fluency processes that students were involved in while working on the project?
- **RQ3 (Mixed Method):**

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- How do the perspectives of computational fluency of fifth-grade students change with the use of Scratch, a coding platform?

Need and Value

The current literature and research studies on Scratch skims the surface of computational fluency. The studies which have been conducted focus on the primary school years leaving a gap within the intermediate grade-level years, especially fifth-grade. Also, the studies focused on coding as an application based on puzzle designs. This study will seek to show the significance of computational fluency by applying Scratch coding technology within a fifth-grade class from a different angle, interactive games, storytelling, and animations.

According to Resnick & Robinson (2018), there is a surge of interest in learning to code with “thousands of apps, websites, and workshops to help kids code” (p.47). There is very little of these specific activities within the classroom (Bers, Seddighin & Sullivan, 2013). A growing interest in the Scratch application in the curriculum fields as a collective teaching tool in education. The need for today’s children to be fluent in coding is valuable in ways to “develop your thinking, develop your voice, and develop your identity” (Resnick & Robinson, 2018). Both the need and value of this study contains the relative links that 21st-century students are lacking, computational fluency and the advantages of using this skill in children’s’ educational and future careers.

Research Design

A mixed methods exploratory sequential research study which warrants the exploration of the coding experiences of participants in a computer classroom. According to Creswell (2015), a qualitative research study permits “in-depth exploration” about the main phenomenon (p. 204). With an exploratory study, the researcher will focus on a “purposeful sampling” which is essential when a researcher wants to study a specific phenomenon or experience (Creswell,

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2015). Using a purposeful sampling method, the researcher will obtain an understanding of the factors which influence the engagement of students within the specific coding activities.

Based on the purpose of this study, the researcher will utilize both qualitative and quantitative data collection methods to measure the understandings and experiences completing an activity in Scratch coding. The participants will have a choice of activity for their final project by keeping in mind that the process of coding leading through the activity is the primary purpose of the lesson. The researcher should be aware of the research questions when conducting the collection of data.

In a qualitative study, the central phenomenon is developed using particular instruments such as observations, in-depth interviews, and questionnaires (Patton, 2015; Creswell 2015). This qualitative instrument for collecting the data interviews, consisting of six to eight questions, with a possibility follow-up questions in the interview. Each interview should last no longer than 30 minutes.

The quantitative research design of this study is a survey which utilizes numbers, statistics, and measurements within a relationship between two variables and tests out theories (Creswell 2015). This research study quantitative measurement will capture the students' experiences and thoughts when creating and interacting their project in the Scratch coding platform. A 5-point Likert scale survey will be used for this phase of the study. The context of the questions will come from the collected data of the first phase, qualitative interviews.

Description and Type of Research Questions

The mixed methods approach utilizes three type of research questions (a) quantitative; (b) qualitative; and (c) mixed methods (Creswell, 2015).

In the qualitative stage of data collection, the possible interview questions are:

1. What did you like most about this coding activity?

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2. What did you not like about this coding activity?
3. What experiences were fun and exciting?
4. How do you feel about coding?
5. How did you use sequencing in this project?
6. How did you feel when the game, animation or story finished successfully?
7. How did you feel when the game, animation or story did not finish successfully?
8. What was the hardest part of the activity?
9. What was the easiest part of the activity?
10. What additional information, suggestions or comments would you like to offer?

In the quantitative stage of data collection, a 5-point Likert scale survey will be administered to a larger group of participants. The statements are determined by the qualitative results, which as of now, have not been identified. A few generic examples are:

I enjoy coding.

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

If the end product is incorrect, I don't mind starting over again.

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

I enjoy taking on challenges.

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

I am detail oriented.

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

Being imaginative is fun.

1	2	3	4	5
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

References

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