Computational Thinking in Language Arts When Teaching Creative and Expository Writing

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ABSTRACT

In language arts instruction, computational thinking skills can be implemented through language arts activities, especially in teaching of diamante poems and expository writing. Instructional materials and activities for an elective language arts course lasting 14 weeks for two hours per week were prepared by the researcher. During the course, an invited speaker presented one instructional session for 23 pre-service elementary school teachers regarding the 'Scratch Program' used to create digital stories. The following week another expert instructed computational thinking skills to these pre-service teachers about how to implement these skills into their language arts activities. Additionally, the researcher provided three hours and 30 minutes of instruction regarding poetry writing and 10 hours instruction on expository writing to increase the pre-service teachers' abstraction, separation, pattern recognition, logical reasoning, pattern decomposition, error detection, and algorithm design skills. Furthermore, the pre-service teachers were trained regarding various writing genres including creative writing. The pre-service teachers were later asked to submit a portfolio of their writing samples and the activities prepared specifically for developing elementary school students' computational thinking skills along with their reflective journals written regarding their experience of learning computational thinking skills. The pre-service teachers were not having or realizing any computational thinking skills in the beginning of the semester. Whereas when the semester ended, their reflective journals and written samples from portfolios showed they had become knowledgeable about computational thinking skills as well as strategies and/or activities used to increase their future students' computational thinking skills.

KEYWORDS

Preservice teachers, computational thinking, poetry writing, expository writing

1. INTRODUCTION

Computational thinking (CT) can be explained as having a mental automated solutions (Yadav, Mayfield, Zhou, Hambrusch, & Korb, 2014). CT includes skills like abstraction, separation, pattern recognition, logical reasoning, pattern decomposition, error detection, and algorithm design skills. Recently, it is argued that CT can be taught at early ages starting from preschool education. However, in order for teachers to be knowledgeable enough to teach CT skills to their students they need to gain appropriate training on developing CT skills during their undergraduate education. This paper explains 23 elementary school preservice teachers' experiences whom were registered for an elective language arts course lasting 14 weeks for two hours per week. The participating pre-service teachers were taught several writing genres including journal, personal, story, poetry, expository, persuasive writing as well as some software programs like 'Scratch' and features and principles of computational thinking skills.

2. PROCEDURE

While teaching poetry and expository writing, the goals were improving pre-service teachers' computational thinking skills especially on abstraction, separation, pattern recognition, logical reasoning, pattern decomposition, error detection and algorithm design. In order to reach these goals some educational activities were designed and implemented in line with the goals determined by the Ministry of National Education (MoNE). Some of these goals were determining the story elements in the texts (The subject of the text, plot, location, time, characters); explaining the contribution of nouns and adjectives to the meaning of the text; realizing the meanings of verbs; distinguishing text types; using information sources effectively; providing information on how to use the contents and glossary in printed and digital content to access information; and writing expository text.

2.1. Poetry Writing – Writing a Diamante Poem

The activities pre-service teachers did on creative writing and poetry writing started with listening to a story. For developing abstraction skills, pre-service teachers listened to and talked about a story. The instructor chose and read a children's picture book in which participants heard several examples of nouns, adjectives, and verbs. The title of the story was not shared with learners. After the story was read, the instructor asked WH questions for them to comprehend the story completely.

To work on abstraction, logical reasoning, and pattern recognition skills, the participants found appropriate titles, adjectives, verbs, and nouns for the story. After the participants correctly answered all the detail questions regarding the story, the instructor asked them to find an appropriate title for the story. Responses of them were taken and written on the board without filtering any responses. Later, as a class, they determined an appropriate title. The instructor asked students and prospective teachers which adjectives they heard in the story. Heard adjectives were listed on the board too. Then, pre-service teachers were asked to think about other adjectives that can be used in the story instead of the listed ones. The same procedure was repeated for other types of words (nouns and verbs). Therefore, they brainstormed again to find different nouns, adjectives and verbs that could be used and were related to the content of the story.

For logical reasoning skills, pre-service teachers chose objects can be seen and used in the classroom. In this activity, they were expected to drag the objects they see in the classroom to the school picture.

By applying CT in language arts the authors aimed that pre-service teachers could identify and represent patterns in different sentences (Mishra et al., 2013). The instructor gave a presentation about different kinds of poems including acrostic, found, concrete, diamante, and etc. and asked to take notes of the prominent features of the poetry genres especially the found poems in order to improve their pattern recognition skills. Based on the rules and examples they saw pre-service teachers selected non-examples which was increasing their error detection skills. Then, they were asked to write an algorithm design for the diamante poem, similar to one given below:
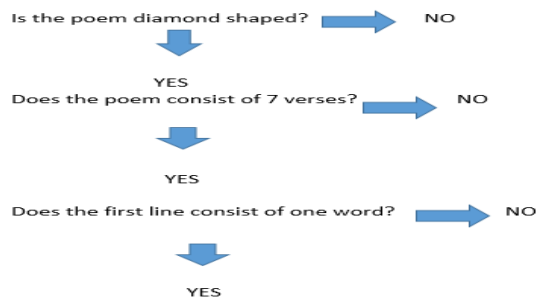
At the end, they were asked to write their own diamante poem, in which they worked on abstraction and pattern recognition skills.

2.2. *Expository Writing - Learning about Fossils*

To increase pre-service teachers' pattern recognition skills the instructor showed two images (one realistic and one imaginal) and asked pre-service teachers about what they thought; were they similar or not? Which one could be fictional or non-fictional? And Why? Then, she shared some statements and asked which ones were the features of expository writing and listed some text types like comics, directions, text books, recipes etc. and asked which ones can be considered as non-fiction text. She also explained the differences between facts and opinions. The participants were given several statements and asked to determine which ones were facts. By doing these three activities, the instructor aimed to increase their logical reasoning skills.

Later, they watched a video about fossils. After seeing the video, the instructor emphasized the importance of the order of the steps in the formation of fossils and pointed out that if this order was not followed correctly, fossils would not be formed. Then, instructor asked them to create and write an algorithm design, in which they described the process and steps regarding the formation of fossils. Thus, they could work on algorithm design skills and since they were summarizing the process of forming fossils they were

also increased their abstraction skills as one of the computational thinking skills. Participants did a research on fossils and by doing this they worked on pattern decomposition and decomposition skills. Then, they composed an expository text regarding fossils by using some of the transitions words given them in the classroom, which can be considered as increasing their abstraction skills.

3. CONCLUSION

The pre-service teachers were asked to submit a portfolio of their writing samples and the activities prepared specifically for developing their future elementary school students' computational thinking skills along with their reflective journals written regarding their experience of learning computational thinking skills. When the semester began, the pre-service teachers stated not knowing about computational thinking skills. Whereas when the semester ended, their reflective journals and written samples from portfolios showed they had become knowledgeable about computational thinking skills as well as strategies and/or activities used to increase their future students' computational thinking skills. In her reflected journal one pre-service teacher wrote: "*I find it very useful to get information about how I can give a critical and an inquiring perspective to my students.*" Another pre-service teacher stated "*I think it is really useful to learn where computational thinking comes into play, especially in the activities of folding paper, educational board games, educational games, etc. We have learned where students use computational thinking skills and where we can apply them better.*" Another pre-service teacher mentioned the importance of CT in solving daily life problems by stating "*Considering that the problems also exist in daily life, we should not ignore that the computational thinking will make our life easier.*" and making learning permanent "*the computational thinking concept will not only make students active during the lesson, but also increase the permanence of the learning.*" In line with the recommendations in NRC report (NRC, 2010) pre-service teachers written activities placed in their portfolios and reflected journals showed that introducing CT skills in fiction and nonfiction writing effectively influenced pre-service teachers' understanding of CT concepts.

4. REFERENCES

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