

The Development and Evaluation of the Origami Curriculum Based on the Concept of STEAM Education

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Abstract

The acronym STEM stands for Science, Technology, Engineering, and Mathematics, and STEM education attempts to develop an interdisciplinary curriculum that is driven by project, problem, exploratory learning, helping students to improve STEM skills, to navigate the ever-changing society and to solve the real-world problems. Afterwards, the Arts is integrated in STEM. Nowadays, the STEAM education has brought tremendous effect to global education.

Since the twelfth five-year, Chinese government has paid high attention to science education, and required students to explain the real world and solve practical problems with what they learned. STEAM education becomes a new trend under such circumstances. Ministry of Education has clearly pointed out to explore the STEAM education in the official documents, and “Primary Science Curriculum Standards” issued in 2017 also recommend to make connection between different subjects when teaching. STEAM education has earned its first pattern. But the types of STEAM curriculum are limited in the early phase, so it’s important to broaden the content of STEAM curriculum. With the development of science and technology, origami has stepped into a new period of development. Driven by a group of scientists, engineers, artists and teachers, modern origami is gradually realizing the combination with science, technology, engineering, mathematics and art. Therefore, the author choose origami as topic to develop a set of STEAM course, which may provide some reference experience for enriching the content of STEAM curriculum. Meanwhile, this trial will show a fresh perspective for students to rediscover the modern origami.

Based on the Science Curriculum Standards for Primary Education and Mathematics Curriculum Standards for Compulsory Education, together with the cognitive characteristics of students of higher grades in primary school, the author designed the O-STEAM course (the O stands for Origami), this course includes five units and a final-work at the class-ending part. The first unit is “Astonishing Origami”, in which students will have an overview about origami from ancient times to modern times, then they will learn the basic skills to fold and divide. The second unit is “Between Folding”, this unit is based on the origami mathematics, students will learn some mathematical theories that related to origami such as Haga’s theorem and fold some polygons. The third unit is “Rigid Origami”, this unit will explain what is rigid origami, what can be done with rigid origami, and how can we fold a simple origami model, such as miura-ori. The forth unit is “the Light and Shadow in the origami”, students will fold some origami-lamp with belly folding or other folding types, where paper circuit could be used. The last unit

is “Modular Origami”, students can fold some kinds of basic units and then connect them together to build varieties of polyhedrons, just like building with blocks. The topic of final-work is “Origami & Life”, which require students to fold something that related to our daily life, and those origami works that can solve some real-life problems will be rather welcomed.

This course was geared for students of higher grades in primary school (i.e., grades 4 to 6), and students had class on weekend. The author was the teacher, two undergraduates and one graduate student were teaching assistants. During the implement of the course, students were surveyed by O-STEAM course pre-test questionnaire, the O-STEAM curriculum self-evaluation, students’ self-efficacy scale, and the author also interviewed some students and made work analysis to their origami works. All these methods were used to collect data about students’ interest on O-STEAM, the capacity to participate in O-STEAM course effectively, the new awareness of the STEAM value that hidden in origami, and the creativity that reflected in origami works.

Through the research above, the follow conclusions could be drew: (1) the O-STEAM greatly raised students’ awareness of the STEAM value hidden in origami, and stimulated students’ interest for further study, especially those students with high creative self-efficacy showed more enthusiasm for further learning; (2) Origami is wonderful as a STEAM course carrier and students increase the STEAM learning experience through O-STEAM curriculum; (3) O-STEAM course has a positive effect on inspiring students’ innovative thinking and behaviors, it can help students solve some problems in the past learning experience creatively as well; (4) there are no gender difference and grade difference in students’ self-evaluation of O-STEAM course, so O-STEAM course is rather adaptive for STEAM education.

Finally, the author made a teaching reflection about the teaching practice, and made a simple prospect outlook for how to carry on the deeper research of O-STEAM course and how to promote the STEAM value of origami.