

ORIGAMI AS AN EDUCATIONAL TOOL AND ITS EFFECT ON THE DEVELOPMENT OF SCHOOL STUDENTS

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Abstract

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In recent years, origami has also made its way into the field of education. Many countries have implemented origami in their educational curricula due to its numerous benefits for student development. Origami has been found to help students in many ways, including the development of cognitive, social, and motor skills. To investigate the effects of origami on student development, a study was conducted using a systematic literature review method. The study focused on articles published between 2018 and March 13, 2023, and utilized keywords such as "origami," "education," "student development," "cognitive skills," "social skills," and "motor skills." Six article selection criteria were established before the selection process, ensuring that only the most relevant and reliable sources were included. For instance, origami was found to be effective in improving students' math and geometry skills. Through the folding of paper, students were able to develop their spatial reasoning, geometric thinking, and problem-solving abilities. Additionally, origami was found to enhance students' fine motor skills, which are essential for various activities, such as writing and drawing. Origami also had a positive impact on students' psychology and emotion, as it provided a calming and relaxing activity that can help students reduce stress and anxiety. Furthermore, origami was found to foster creativity and critical thinking, as it requires students to think creatively and strategically when designing their paper creations.

Keywords: origami, students' development, systematic literature review

1. INTRODUCTION

Origami is an art form that originated in Japanese culture and involves folding a piece of paper into intricate shapes and designs. The word 'ori' means folding, and 'kami' means paper (Cakmak et al., 2014; Purnell, 2009; Kusumaningrum, 2013; Caruana & Pace, 2007). Although origami has been used as a hobby by society for centuries, it is also a valuable educational tool that can promote cognitive and social development. When used in the classroom, origami can help students develop a variety of skills, including space reasoning, critical thinking, problem solving, and fine motor skills (Anazco & Zurn-Birkhimer, 2020; Cakmak et al., 2014). This art of origami has long been practised in teaching and learning process around the world. According to Lang (2009), in 1992, the Israeli Origami Centre (OIC) began teaching origami to children with the objective of developing their learning skills. The programme was designed to enhance their identity and provide opportunities for students to feel proud of their achievements.

Meanwhile, Arslan (2016) stated that origami education has been introduced into the educational curriculum of primary and secondary schools in Turkey. In fact, some higher educational institutions have also introduced several optional courses related to origami in an effort to introduce this education to prospective teachers in Turkey. The use of origami and kirigami art in education has been widely adopted, especially in mathematics education (Arici & Aslan-Tutak, 2013). This art has also been applied in many fields, such as engineering, architecture, furniture design, interior design, landscaping, fashion, and more (Ariandini & Martono, 2013; Marji et al., 2023; Sorguç & Hagiwara, 2009).

However, in Malaysia, the use of origami and kirigami art is mainly focused on the subject of arts and visual arts education and is considered merely a handicraft and a creative art form.

One of the benefits of using origami in the classroom is its practical nature, which involves students in the learning process. Origami requires students to concentrate their attention and use their hands to manipulate paper, which can improve their fine motor skills (Sandra Adetya & Gina, 2022). Moreover, since origami is a visual and tactile activity, it can be used to teach a variety of subjects, including geometry, biology, physics, and art (Cakmak et al., 2014; Endo & Sugiyama, 2011). In addition, there is evidence that origami can improve cognitive skills, especially in the field of spatial reasoning (Anazco & Zurn-Birkhimer, 2020; Boakes, 2006). Spatial reasoning is the ability to visualise and manipulate objects in space, and it is an important skill for many academic disciplines, including mathematics, science, and engineering (Mohd Safarin Nordin & Diyana Abdul Razak, 2010; Muhammad Sukri Saud & Lee Ming Foong, 2007). Besides its cognitive benefits, origami can also promote social and emotional development. For instance, origami can be used to teach teamwork, communication, and empathy. When working on an origami project together, students must communicate effectively to ensure they are working towards a common goal. Additionally, because origami can be challenging and requires great patience, students can learn to persevere and develop a growth mindset. Finally, origami can be used as a tool for self-expression and relaxation, which can have a positive impact on students' emotional wellbeing (Anazco & Zurn-Birkhimer, 2020; Boakes, 2006).

Origami has been used as a teaching tool in many countries for years. According to Cornelius and Tubis (2002), this ancient art from Japan and China has been used not only for fun in the classroom but also as a teaching method and aid, particularly in mathematics. Many countries have introduced and taught origami to students for various objectives, including creativity, communication skills, visualization, mathematics, and more. Organizations such as Origami USA and the British Origami Society have been developed to create awareness in the community about the importance and potential use of this art in various fields. They have also organized international conferences on origami in education and therapy, starting in 1991. Some countries, such as Turkey, have introduced origami education into their school curriculum and provided origami training to teachers. Despite the many potential benefits of origami to students, researchers still do not know enough about its effectiveness as an educational tool. Studies conducted by Arslan and Akif (2016), Boakes (2006), and Purnell (2009) have focused on the effects of origami only on a single skill or aspect, such as visualization ability, geometry, fine motor skills, and so on. Therefore, the purpose of this study is to conduct a systematic review of the effects of using origami as an educational tool on students' development, covering cognitive aspects and not only focusing on one aspect but covering all aspects that involve school students.

2. METHOD

The method used in this study is a systematic review method. The systematic review method is a research method that identifies, evaluates, and interprets all findings on research topics to answer previously defined research questions. Based on Ramey & Rao (2011), the study of systematic literature aims to improve the synthesis of research by introducing a systematic, transparent, and reproducible literature review process. Reviews of systematic literature provide an overview of the state of research on a particular topic and allow an assessment of the quality of individual studies. They also allowed the results of different studies to be assessed together when these studies were inconsistent (Ressing et al., 2009). A comprehensive search of electronic databases including Scopus, Web of Science, and Google Scholar was conducted to identify relevant studies. The search included keywords such as "origami," "education," "student development," "cognitive skills," "social skills," and "motor skills." This search is limited to studies published from 2018 to 2023 on March 13, 2023.

Studies will be included if they meet the following criteria: (1) origami is used as an educational tool, (2) participants are school students, (3) outcomes include cognitive, social, or motor development, (4) empirical studies, (5) open access articles with PDF files provided, and (6) published in English, Malay or Indonesian between 2018 and 2023. Studies will be excluded if they are not empirical studies



or if they do not focus on origami as an educational tool and do not comply with all 6 criteria described above. Full-text articles will be taken for studies that meet the entry criteria, and reviewers will evaluate them for eligibility. Data extraction will include the following information: study design, sample size, age and gender of participants, details of the intervention, outcome measures, and results. As a result of the selection process, researchers have identified 22 articles that will be used as samples in this study. This systematic study aims to provide a comprehensive analysis of the existing literature on origami as an educational tool and its impact on the development of students. This review will help identify the effectiveness of origami as an educational tool and provide insights into the potential for its use in schools to improve student development.

3. RESULTS AND DISCUSSION

3.1 The Effect of Origami on Improving Students Mathematics and Geometry Skill.

Based on the conducted research, there are four aspects of student development that can be enhanced through origami activities. These aspects are: 1. Mathematical or Geometrical Performance, 2. fine motor skill; 3. psychology and emotional development; and 4. creativity or creative thinking.

Table 1. List of Articles Involving the Effect of Origami on Improving Students Mathematic and Geometry Skills

No	Writers	Article Title
1	(Stanislaus Unodiaku, 2022)	Effectiveness of Origami-based Instructional Model Approach (Obima) on Secondary School Students' Academic Performance and Interest in Mensuration, Enugu State, Nigeria
2	(Bornasal, 2021)	Effect of Paper Folding (Origami) Instruction in Teaching Geometry
3	(Ekene & A, 2022)	Origami-Based Instruction and Junior Secondary School Students' Academic Performance in Mathematics in Rivers State
4	(Klemer & Rapoport, 2020)	Origami and GeoGebra Activities Contribute to Geometric Thinking in Second Graders
5	(Trisniawati et al., 2018)	Implementation of Origamasains Learning to Grow Love for Mathematics And Science From Early Age
6	(Afriansyah & Arwadi, 2021)	Learning Trajectory of Quadrilateral Applying Realistic Mathematics Education: Origami-Based Tasks
7	(Natalija et al., 2019)	Teaching Advanced Mathematical Concepts with Origami and GeoGebra Augmented Reality
8	(Tella & Sulaimon, 2022)	Improving Pupils' Achievement in Fraction Using Inquiry-Based Instructional Strategy Enriched With Origami Activities

Table 1 shows a list of eight articles involving the effect of origami on improving students math and geometry skills. Studies conducted by Stanislaus Unodiaku (2022) and Trisniawati et al (2018) found that students' interest in the subject of mathematics can be enhanced by incorporating origami activities into the teaching of the subject. In addition, by introducing origami activities in the teaching of mathematics, it can have an impact on the improvement of student achievement in the subject (Ekene & A, 2022; Tella & Sulaimon, 2022). An origami activity involves following a set of instructions to create the desired shape or figure, which requires accuracy and attention to detail. In mathematics, origami can be used to teach various concepts, such as geometry, fractions, angles, and symmetry (Afriansyah & Arwadi, 2021; Budinski & Lavicza, 2019). Through origami, students can develop spatial thinking skills, which are very important in geometry and other mathematical fields (Arici & Aslan-Tutak, 2013). They learn to visualise two- and three-dimensional objects and understand their properties. Origami also teaches students to follow the sequence of steps in a certain order, which helps to develop logical thinking and problem-solving skills.

Moreover, origami is a great way to teach fractions, since students must divide the paper into halves, quarters, or eight parts to create a specific shape (Tella & Sulaimon, 2022). They also learn

about angles when creating shapes such as triangles, squares, and polygons. In addition, the activity of folding and opening papers helps students develop a sense of intuitive symmetry, which is important in geometry and art. Origami can help students visualise geometric concepts more concretely and easily. The activity of folding paper and shaping it into geometric shapes can help students understand the relationship between geometric shapes and recognise basic properties such as angle, side, and symmetry (Bornasal, 2021). Through origami, students can develop their spatial thinking abilities, namely the ability to visualise and manipulate objects in space. This ability is important in understanding geometric concepts, such as the properties of geometric shapes and how they interact with each other. In addition, origami can help students gain practical experience in creating and manipulating geometric shapes. Students can learn how to make geometric shapes with precision and accuracy and measure sides and angles accurately. Origami can also help students understand how simple geometric manipulations, such as twisting, folding, and flipping, can produce different shapes (Klemer & Rapoport, 2020). In conclusion, origami is a versatile tool that can be used to teach various mathematical concepts. This activity involves students practically and interactively, promoting creativity and problem-solving skills. By incorporating origami into math lessons, teachers can make math learning more pleasant and accessible to all students, regardless of their learning style.

3.2 The Effect of Origami on Improving Students Fine Motor Skill

Table 2. List of Articles Involving the Effect of Origami on Improving Students Fine Motor Skill

No	Writers	Article Title
1	(Harsismanto et al., 2021)	Effectiveness of Playing Origami Intervention on Improvement of Fine Motor Development Pre School Children
2	(Anisa et al., 2021)	Playing Origami And Its Impact On Fine Motor Skills Development Of Children Aged 4-5
3	(Cllaudia et al., 2018)	Origami Game for Improving Fine Motor Skills for Children 4-5 Years Old in Gang Buaya Village in Salatiga
4	(Pradipta & Dewantoro, 2019)	Origami And Fine Motoric Ability Of Intellectual Disability Students
5	(Valentina et al., 2019)	Efforts to develop fine motor skills through origami activities with demonstration methods in group B children at TK Bina Nusantara
6	(Wahyuni et al., 2020)	The Effect of Origami's Educative Toys on the Child's Fine Motor Development In TK Frater Bakti Luhur Makassar
7	(Harahap & Seprina, 2019)	Child's Fine Motoring Ability through Origami Paper Folding Activities
8	(Sandra Adetya & Gina, 2022)	Playing origami to train the fine motor skills of early age children

Table 2 shows a list of eight articles involving the effect of origami on improving students fine motor skills. Origami activities can provide many benefits to students' fine motor skills. The activity of folding paper and shaping it into a certain shape requires good fine motor skills, which is the ability to control the movements of the fingers on the hands in a coordinated and precise manner. Through origami activities, students will practise and strengthen their fine motor skills. They will learn to manipulate paper carefully and accurately and develop sensitivity to small and subtle movements. This activity can help improve coordination between hands and eyes as well as accuracy in the movement of the fingers and hands (Anisa et al., 2021; Harsismanto et al., 2021).. In addition, origami activities can also help to increase students' concentration and patience. This activity requires focus and perseverance to follow instructions and produce the desired shape. In the process of folding and forming origami, students will learn to handle impulses and carefully complete tasks (Cllaudia et al., 2018).

By improving fine motor skills, origami activities can also help students in other areas, such as writing, drawing, and performing tasks that require subtle and precise movement of the fingers of the hands. Therefore, the use of origami in education can help improve students' overall fine motor ability (Pradipta & Dewantoro, 2019; Valentina et al., 2019; Wahyuni et al., 2020). Overall, origami activities can provide many benefits to students' fine motor skills. By practising folding and forming origami, students can improve hand-eye coordination, accuracy of hand and finger movements, and concentration. Therefore, origami can be an effective learning tool for strengthening students' fine motor skills (Harahap & Seprina, 2019; Sandra Adetya & Gina, 2022).

3.3 The Effect of Origami on Students Psychology and Emotion

Table 3. List of Articles Involving the Effect of Origami on Students Psychology and Emotion

No	Writers	Article Title
1	(Islam et al., 2019)	Effectiveness Of Origami on Anxiety Among Hospitalized Children in A Tertiary Care Hospital- A Pilot Study
2	(Christabel, 2018)	Effectiveness of origami on hospitalized anxiety among children
3	(Nengsih, 2020)	Origami as Adjuvant Atraumatic Care Action Against Anxiety Levels of Children Undergoing Hospitalization in Rsud 45 Kuningan

Table 3 shows a list of three articles involving the effect of origami on students psychology and emotions. Origami activities can provide many benefits to the psychology and emotions of students. Folding paper and shaping it into a certain form can give students the opportunity to relax and express themselves creatively (Boakes, 2006). One of the main benefits of origami is increased self-confidence and satisfaction. Students can feel proud of their ability to create complex and beautiful forms of origami and feel good about their work. It can help increase confidence and motivate students to try new things and explore their creativity. In addition, origami activities can also help reduce stress and anxiety (Islam et al., 2019). This activity can give students the opportunity to release tension and feel relaxed. Folding and forming paper can be a meditative activity that helps students relieve stress and improve their mental well-being. Studies conducted by Christabel, 2018; Nengsih (2020) found that origami activities can reduce the stress and anxiety experienced by students when they are hospitalised and help them adapt to a new environment better. Overall, origami activity can provide many benefits to students' psychology and emotions. This activity can increase confidence, reduce stress and anxiety, and improve social skills. Hence, the use of origami in education can help improve students' mental and emotional well-being as well as increase their motivation to learn.

3.4 The Effect of Origami on Improving Students Creativity and Creative Thinking

Table 4. List of Articles Involving the Effect of Origami on Students Creativity and Creative Thinking

No	Writers	Article Title
1	(Wati, 2019)	Increasing Creativity of Early Childhood Through Origami Playing Activities
2	(Husna et al., 2019)	The Influence of Origami Activities of Washi Papers on Child Creativity in Taman Kanak-Kanak Aisyiah No. 1 Muara Panas Kabupaten Solok
3	(Wawointana et al., 2022)	Train Students' Creativity with Paper Folding Media Using Origami Paper

Table 4 shows a list of three articles involving the effect of origami on students creativity and creative thinking. Origami activities can provide many benefits to students' creativity and creative thinking (Wati, 2019). The activity of folding paper and shaping it into a certain shape requires the ability to think outside the box and find creative solutions to complete tasks. In performing origami

activities, students need to think of various ways to come up with unique and interesting forms. It can help improve students' creative abilities and help them train their creative thinking ability, which is the ability to find solutions beyond conventional thinking. In addition, origami activities can also help students develop their imagination and inventiveness. In creating complex and interesting forms of origami, students need to think visually and imagine how paper can be folded and shaped to achieve the desired results. This can help train students' imagination and inventive abilities (Wawointana et al., 2022). Overall, origami activities can bring many benefits to students' creativity and creative thinking. This activity can help improve creative abilities, train creative thinking abilities, develop imagination and invention, and improve problem-solving skills, according to the results of studies conducted by Husna et al (2019).. Hence, the use of origami in education can help to improve students' overall creativity and creative thinking.

4. CONCLUSION

Based on the studies that have been carried out, it is clear that origami activities can provide many benefits to the students development. In terms of mathematics education, origami activities can help improve the ability to measure, compare, and understand geometric relationships. In addition, logical thinking and problem solving can also be learned through the process of creating origami. In addition, origami activities are also able to attract students to become more interested in the subject of mathematics. In terms of fine motor skills, origami activities can help improve fine motor ability and hand-eye coordination. This will help improve writing skills, holding stationery, and carry out delicate tasks that require accuracy. In psychological and emotional aspects, making origami can help reduce stress, reduce anxiety, and increase students concentration. This activity can also help develop the abilities of patience and perseverance, as well as provide a feeling of satisfaction when looking at the final result of the origami work. In terms of creativity, origami activities can enhance the skills of creative and innovative thinking, promote courage in experimenting with new materials, and expand knowledge of art. In addition, this also promotes the ability to see familiar objects from a new and creative perspective.

In conclusion, origami activity gives a lot of positive advantages for the development of students. This not only improves mathematical knowledge and fine motor skills, but also helps to improve psychological and emotional aspects and promotes creativity. Therefore, origami activities are worth considering as one of the fun and useful learning methods in teaching and learning. Therefore, various studies should be carried out to look at the positive effects of origami on other aspects so that the potential use of origami in the field of education can be known more widely. In addition, the perception of the community also needs to be changed to see origami as an art that has greater potential in the field of education and is not only seen as a mere handicraft.

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