

# Theoretical, Psychological, and Philosophical Interrelation in Mathematics Learning through YouTube for Elementary School Students

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## ABSTRACT

Modern education integrates several aspects as a single unit of learning, especially for elementary school students. This study identifies the interrelation of art, technology, education, and mathematics for elementary school students. A new style of education that incorporates both the arts and the sciences is also considered in this research: interactive learning. Using netnography, this investigation takes a multi-site qualitative approach. Furthermore, the study was conducted by conducting netnographic observations on the YouTube channel with the keyword "Elementary School Mathematics (language: Indonesian)" during July 2021 and analyzed by conducting a theoretical exploration of art, psychological, and philosophical interrelationship technology education. The results show that the interrelation that occurs begins with elaborating aspects of the STEAM approach, which at each point is in learning through art technology on YouTube. This contributes psychologically and affects children's critical thinking skills. Furthermore, there is a postphenomenological aspect as an outcome of the interrelation that occurs.

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## 1. INTRODUCTION

Mathematics education for children is a compulsory education in the conception of children's education and language education, interaction, and independence. In Indonesia itself, mathematics is a compulsory subject that is always present at the education level (Kidi et al., 2017; Ramani & Eason, 2015). However, on the other hand, for some people, mathematics is a subject that is feared because mathematics is known as a numeracy subject, which requires high focus, memorization, and reasoning.

The importance of students learning mathematics, namely because mathematics is "(1) a clear and logical means of thinking, (2) a means to solve problems of everyday life, (3) a means of recognizing patterns of relationships and generalizing experiences, (4) a means of to develop creativity, and (5) a

means to increase awareness of cultural development" (Hull et al., 2018; Linebarger, 2011; Taner Derman et al., 2020). Therefore, mathematics is a compulsory subject that is needed. That is, it is a subject that is considered core. However, the use of mathematics in collaboration with other subjects or disciplines is still under-explored. This is because conventional learning is still teacher-centred, so the teacher conveys learning with lectures and expository materials, while students only listen and record it in notebooks (Damary et al., 2017; Ramani & Eason, 2015). This learning model tends to make students passive so that students feel bored in receiving mathematics lessons and are reluctant to express ideas or solutions to problems given by the teacher—likewise, the potential for mathematics to collaborate with art technology (Hash, 2021; Ramani & Eason, 2015).

Art undeniably adorns almost all aspects of human life (M. B. T. Sampurno et al., 2020; T. Sampurno, 2015). Daily activities cannot be separated from artistic experiences, including the exact discipline, which is often considered to be on the opposite side of art (Slota et al., 2018). The interrelation between art and the exact discipline, which in this study is mathematics, provides collaboration for the art experience that the creators, both art practitioners, and mathematics teachers, responded to.

Empirically, the task of mathematics education in schools is transmitting mathematical concepts encounters several obstacles. Talking about the study materials for mathematics education in Indonesia, many students still do not understand mathematical concepts comprehensively (Hull et al., 2018). Especially in areas other than Java and Bali, many schools have problems understanding and teaching mathematics itself. Alternatively, even though they have adequate supporting instruments for learning mathematics, teachers who teach in schools cannot maximize them. The state of education in Indonesia presents a space for utilizing digital art technology collaboration through video to transmit information on mathematics education in elementary schools (Sudarsana et al., 2019; Waldron, 2013). Using YouTube as a medium without considering the learning context will not produce anything educational. For example, mainstream YouTube is not a great source for an all-encompassing fun math learning experience. However, YouTube can be used as a complementary learning medium and to exemplify mathematical concepts from a new perspective.

Concerning collaborative learning, technological developments have significantly changed the way people live. Education is a field that cannot escape the reach of technology. According to Koskoff's writings, the development of computers that flourished in the 90s also changed how education is produced (Bown & Ferguson, 2018; Colman, 2018; Crawford, 2017). An interdisciplinary approach that explores the potential of technology to be used as learning support. Technology, in this case, is a product of the Internet of Things (IoT) which is software that functions to support teachers in delivering material (Brinkley-Etzkorn, 2018; Lee, 2017). One of the products of IoT that has been widely developed is the video-sharing platform "YouTube."

YouTube creates a relationship of interaction and communication between users. YouTube as an online communication medium can be reached widely and easily. Social media that has been developed is expected to create a virtual community and can introduce oneself from a user to the wider community (E. Chandra, 2017). The use of society as a medium for channelling hobbies and self-existence is made to show who they are to society, thus giving rise to differences for each individual. This article is about the potential use of YouTube in mathematics learning. The purpose of writing this article is to provide information so that it can be used as a source of reading to readers about the potential use of YouTube in mathematics learning. Although many articles have been discussed before, this writing is presented differently. The author highlights the advantages of using YouTube, one of which is that YouTube can motivate students to continue learning, because the conditions and atmosphere of interactive and fun learning and the information obtained are well absorbed. Learning that is carried out online makes it very difficult for students to understand the material so that the material obtained is less than optimal, resulting in decreased student achievement and interest in learning. This journal is reviewed from a variety of relevant library sources. The author examines ideas, opinions, or findings in the literature to provide theoretical information related to the potential use of YouTube in mathematics learning. The

results of this literature review research are expected to be material for information and reference in making decisions and policies in order to carry out an interesting and fun learning.

Youtube is a platform for uploading videos and watching videos that contain various types of information and can be enjoyed at any time with an adequate internet network. Uploading videos is done in order to get appreciation from YouTube users. In education, YouTube is developed as a teaching medium, and to continue to grow, the number of followers, video concepts, and views must be consistent according to segmentation (Sudarsana et al., 2019). The packaged concept must be attractive so that students will pay attention to the subject matter displayed, and the content must also follow curriculum developments so that YouTube becomes a good learning resource through guidance from teachers regarding its use. According to Kumala (2021), the use of YouTube will significantly positively affect students' interest and motivation in participating in online mathematics learning. Therefore, this study identifies the interrelation of art, technology, education, and mathematics for elementary school students. This study also considers interactive learning that combines art and mathematics as a new modern learning model.

## 2. METHODS

This study explores the relationship based on phenomena in mathematics learning through art technology on YouTube. Therefore, this qualitative study uses a content analysis approach of modern virtual learning, art experience, numerical interrelation, and alternative educational spaces (Denzin & Lincoln, 2013; Leavy, 2017). The literature used in this study is sourced from articles and online journals related to the title and content of the study. Literature search activities are just as important as data collection, if they are adequate from the start.

References referenced in the last 10 years serve as a marker that the information available is up-to-date to be relevant. The study was conducted by conducting netnographic observations on the YouTube channel with the keyword "Elementary School Mathematics (language: Indonesian)" during July 2021 and analyzed by conducting a theoretical exploration of art, psychological, and philosophical interrelation technology education. Netnography is an ethnography on the Internet, or from "Inter[net] and eth[nography]," which deals not only with words but with various data that can be collected through online media (Boellstorff et al., 2012; Fabian, 2008; Hine, 2001). Therefore, this research's data is obtained through classical ethnography and online media, especially the YouTube channel.

## 3. FINDINGS AND DISCUSSION

### 3.1 *The STEAM approach*

The interrelation and collaboration between technology, art, and mathematics within the digital technology framework identifies and elaborates on the STEAM approach. This is based on education itself which is an effort to prepare students through learning activities to help students actively develop their potential, abilities, and talents (Canter, 2012; Yakob et al., 2021). Therefore, learning in the world of education must improve students' process skills and social and exact skills. Education affects the quality of human resources produced. One form of educational reform can be carried out using a learning approach that can assist teachers in creating experts, namely the STEM (Science, Technology, Engineering, and Mathematics) approach (Pittinsky & Diamante, 2015). This STEM approach is an approach that refers to the four components of science, namely integrated science, technology, engineering, and mathematics. The term STEM has existed since the 1990s in the United States using the term SMET (Science, Mathematics, Engineering, Technology) by the NSF (National Science Foundation) office (Adiwijaya & Rizky, 2018; Canter, 2012; Yakob et al., 2021). However, since SMET sounds almost identical to "smut," according to the NSF employee, STEM has changed. STEM education is defined as an integrated learning approach from science, technology, engineering, and mathematics as a learning approach that combines two or more fields of science. This developed in STEAM is a

combination of STEM with elements of "Art" or art, an integrated approach that combines the subjects of Science, Technology, Engineering, Art, and Mathematics to develop student inquiry, communication, and critical thinking during learning (S. Kim et al., 2018; Patton et al., 2020). It is an adaptation of STEM, highlighting the relationship of two or more content areas to guide instruction through observation, investigation, and problem-solving (Singer et al., 2006; Tay et al., 2017; Yakob et al., 2021).

The STEAM approach became the first identification in integrating art technology in mathematics learning on YouTube for elementary school students. Through YouTube, several aspects affect critical thinking skills. First, observe, in which elementary school students are motivated to observe various phenomena/issues in the daily life environment related to the concept of science in mathematics learning that is being discussed. Through this observation, math content creators on YouTube integrate everyday events and are associated with mathematical concepts. This activity is reminiscent of the storytelling strategy in providing understanding to elementary school students (Cannon, 2018; Ross, 2017). Like storytelling, it can be set to have fluctuations and tensions. Some parts are challenging, but some parts are light, fresh, and witty. This makes children's cognition work in a variety of ways. In addition to preventing boredom, this can also strengthen children's interest and attachment to mathematical logic activities or calculations in stories.

Second, the "new idea" aspect, where elementary school students observe and seek additional information about various phenomena or issues related to the math topic being discussed, after which elementary school students think of new ideas from the existing information. In this step, students need skills and analyze and think critically. The "new idea" aspect is also integrated into the discovery learning model, a learning activity that occurs as a result of activities in manipulating, structuring, and transforming information to find new information (Pittinsky & Diamante, 2015; Ulger, 2019). This learning requires teachers to be more creative in creating situations that can make students learn actively to find their knowledge or concepts. This is represented in YouTube's massive content providing material on math problems. Through videos that are considered "outside the school context," it provides elementary school students with refreshing media and learning. Herbert Read's argument says about education through arts, which provides elements of critical thinking through art media which in the context of this research is mathematics for elementary school students (Read, 1970; Siegle, 2015).

Third is innovation, where elementary school students are asked to describe what things must be done so that the ideas that have been generated in the previous new idea step can be applied after viewing mathematics learning materials through YouTube. The innovation aspect is related to contextual teaching and learning, which puts forward learning that helps teachers and students relate the material being taught to real-world situations and encourages students to make connections between their knowledge and its application in their daily lives (Hull et al., 2018). Furthermore, YouTube videos have integrated the main components of contextual learning, namely constructivism, questioning, inquiry, community learning, modelling, and authentic assessment.

Fourth is creativity, where the implementation of all suggestions and opinions resulting from discussions about ideas can be applied. There is a learning concept popularized by John Dewey, which is related to education through art (Dewey, 1980, 1997; Fott, 2009). Mathematics education through art technology explores YouTube as a medium or arena where scientific contemplation occurs. That is, mathematics through art technology becomes a learning medium that accommodates various disciplines (Moran, 2002). This learning concept supports teachers in the learning process for elementary school students. Therefore, creativity is certainly an outcome that elementary school students must obtain with the material through YouTube. This creativity integrates eco-connectivity from the connectivity concept popularized by George (Jacobs et al., 2016). Eco-connectivity is the integration of explored and networked principles and explores the complexities of classroom management theories (Brady et al., 2018; Coles & Pasquier, 2015; Liu & Luton, 2011). Online learning with the concept of eco-connectivity is a learning process that occurs in an online environment which

is a derivative of the core elements of learning mathematics with art technology for elementary school students that prioritizes the concept of playing and having fun, which is fully under the control of teachers and parents as a learning facilitator (Ramani & Eason, 2015; M. B. T. Sampurno et al., 2020; T. Sampurno, 2015). Furthermore, the concept of eco-connectivity provides flexibility that can go beyond mainstream learning management and focuses on linking materials, media, competencies, and connections that enable elementary school students to learn more.

Identification of the STEAM elaboration above is then viewed psychologically. Both teachers and elementary school students experience the process of interacting with their art experiences on YouTube with math material (Burns et al., 2017). The process comes from sensing, feeling, thinking, and other things that support the stages of the experience of learning mathematics with art technology (Harton et al., 2002; Taner Derman et al., 2020). By inquiring about the work of thought, the discussion will inevitably turn to intelligence.

Intelligence is defined as a person's capacity to learn from experience, acquire knowledge, and effectively utilize resources to adapt to new situations or solve problems. The expert's explanation emphasized that experience-based learning is, in fact, one of the factors that contribute to intelligence (Furnham & Bachtiar, 2008; Parker, 2016). Mathematics education via YouTube is no exception. Naturally, the process stages are considered part of the concept of "intelligence." However, the reality is that the nature of intelligence is frequently defined solely in terms of scientific potential and precision. The public perception of art is that it is not intellectual or intelligent. Indeed, everything is well integrated into this interdisciplinary era.

Talking about intelligence, it is ironic that society, in general, identifies intelligence with mere cognitive aspects (Agnoli et al., 2016; Gao & Wang, 2019). Those who are smart have good grades in their subjects and can get into the best schools and colleges. Those who are academically smart are believed to have a high level of intelligence, and vice versa. However, it is necessary to develop multiple intelligences obtained from learning mathematics with art technology through YouTube in this modern era.

Multiple intelligences that link art and mathematics in elementary school students develop interdisciplinary concepts that revolve around the exact sciences (Agnoli et al., 2016; Russell & Haston, 2015). Several points on multiple intelligences even directly become crucial things affecting critical thinking and spatial intelligence. The theory of multiple intelligences opens the horizon of intelligence to various fields.

Apart from intelligence, this research also uses creativity as a point of view because it is an important factor in forming an artistic experience. Creativity is a manifestation of ingenuity related to the imagination in some valuable pursuits (Glăveanu, 2016; James & Sternberg, 2010). Through this, teachers and students wander in the experience of learning mathematics by involving imagination activities through learning mathematics with art technology through YouTube.

In this regard, the interrelation of multiple intelligences in learning mathematics with art technology through YouTube provides an art experience that is experienced (Dewey, 1980; Read, 1970). Art experience is also a complete experience involving feelings, thoughts, sensing, and various human intuitions. It is just that the experience of art takes place in a certain quality of experience that is sometimes not the same as an everyday experience (Shokeid, 2012). In the experience of art, the element of feeling is the main force that moves and underlies the other elements of human potential. Work can also give birth to a thoughtful conclusion, but that happens after the experience of learning mathematics with art technology through YouTube is complete. With a focus, the student can experience learning mathematics with art technology through YouTube as a whole. That wholeness makes all elements of experience have meaning and depth. These experiences occur through activities that connect the elements of experience obtained from sensing to learning mathematics with art technology through YouTube (B. Kim et al., 2002; Sandfort, 2016).

John Dewey categorizes two artistic experiences as artistic experiences (the act of production) and aesthetic experiences (perception and enjoyment), which also influence multiple intelligences (Dewey,

1997). Artistic experience is an artistic experience that occurs in the process of creating a work of art. This experience is felt by artists or art creators when carrying out artistic activities. The process is called the creative process. At the same time, the aesthetic experience is the experience felt by the connoisseur of an aesthetic work (in the sense of beauty) (Giannakos et al., 2017; M. B. T. Sampurno, 2017; T. Sampurno, 2015). Therefore, using the term aesthetic, the context can be intended to enjoy works of art and natural beauty. It has to do with how the brain responds to numerical abilities explored in learning mathematics with state-of-the-art technology via YouTube.

Associated with learning mathematics with art technology through YouTube in psychology, the aesthetic experience is a psychological process focused on an object. In contrast, other objects such as the atmosphere and worries of everyday problems are forgotten for a moment. *Aesthetic experience* is a special relationship created between subject and object where the object greatly affects the subject's mind by blurring the object and the surrounding atmosphere in learning mathematics with art technology through YouTube (Dewey, 1980; Hudson, 2020; Kewalramani et al., 2020; Sajnani et al., 2020).

### 3.2 Learning mathematics with art technology via YouTube

Learning mathematics with art technology via YouTube, there is a "resonance" between a particular work of art and the viewer's sense of self that occurs during an intense aesthetic experience, as distinct from explicitly referential emotions such as pride, guilt, and shame, in that it involves an assessment of self-responsibility (Lim & Wang, 2005; Lin et al., 2015; Walby et al., 2017). on an event. There are several criteria for integrating mathematics learning with art technology through YouTube. First, object directness relates to a form of mental condition when viewing properties objectively, both in terms of quality or perceptions or desires that attract attention and are associated with feelings. Second, felt freedom refers to the sensation of being liberated from the dominance of certain past and future concerns. It is also connected to relaxation and the sense of harmony presented or implied semantically or implicitly. Thirdly, the detached effect is a sensation caused by an object's emotional attraction to something dark and terrible. This leads people to believe they possess the capacity to expand beyond the scope of their current endeavours. Fourthly, active discovery, in the form of active feelings, challenges the constructive capacity of thinking by generating stimuli that promote coherence.

Additionally, it establishes a connection between perspective and meaning and is influenced by both illusion and intelligence. Finally, there is wholeness, more precisely the sense of integration felt by someone who has been restored to wholeness following a divisive and destructive influence (Beckers et al., 2016; Brugar & Roberts, 2018; Lopert & Koletnik, 2019). However, it demonstrates self-acceptance and self-expansion through mathematics education using cutting-edge technology via YouTube. The five characteristics listed above demonstrate how art is connected to human thought, including the concept of intelligence.

The nature of multiple intelligences is by the concept of "the ability to solve problems, or to fashion products, that are valued in one or more cultural or community settings" as well as society (Jumadi et al., 2021; Sample et al., 2018; Villalón & Feld, 2016). Ability is called intelligence or intelligence if it shows a person's skills and abilities to solve problems and difficulties found in his life. In addition, it can also create a new product and can even create the next problem that allows the development of new knowledge. So, in these abilities, there are elements of knowledge and skills. Furthermore, this ability has an impact on the ability to solve problems experienced in real life. However, it does not stop there. Knowledge can also create further problems based on the problems solved to develop more advanced and sophisticated knowledge (Dubowsky, 2016; Redden, 2013).

Since 1983, Howard Gardner has developed the theory of multiple intelligences and their educational applications, which were developed in the Zero project (Gardner, 2003; Gomis-Porqueras & Rodrigues-Neto, 2018; James & Sternberg, 2010). At the beginning of his research, Gardner only identified seven types of intelligence, namely linguistic intelligence or linguistic intelligence (language), musical intelligence or musical intelligence, logical/mathematical intelligence or logical-mathematical intelligence, visual/spatial intelligence, or visual-spatial intelligence, body/kinetic intelligence or

intelligence (Gardner, 2003; Gardner et al., 1996; Mark Lynch, 1995). Bodily-kinesthetic, intrapersonal intelligence or intrapersonal intelligence, interpersonal intelligence or interpersonal intelligence (Gardner, 2003). Over time the theory also developed. Gardner added two types of intelligence, namely natural intelligence or environmental intelligence and existential intelligence or existential intelligence (Gardner et al., 1996).

Language intelligence is a person's ability to use words, both orally and in writing, to express his ideas or ideas. People who have high linguistic intelligence will be able to speak fluently, well, and completely. In addition, it will also be easy to know and develop languages and easy to learn various languages. Mathematical intelligence is intelligence related to the ability to use numbers and logic effectively (Sternberg et al., 2003). This intelligence includes sensitivity to logical patterns, abstraction, categorization, and calculation. Spatial intelligence is a person's ability to accurately capture the world of visual space, such as that of a decorator and architect. Examples include recognizing shapes and objects correctly, changing the shape of objects in mind and recognizing these changes, describing a thing/object in mind, changing it in real form, and expressing data in a graph. Physical intelligence is a person's ability to actively use parts or the whole body to communicate and solve problems (Furnham et al., 2011; Furnham & Bachtiar, 2008). People who have this intelligence can easily express themselves with their body movements. Whatever they think and feel can be expressed with gestures.

The philosophical exploration of learning mathematics with art technology through YouTube has a postphenomenological aspect. Postphenomenology sees technological artifacts, which in this research is YouTube as a mediator of experience in a non-neutral (not deterministic) way so that it explores the relationship of creator-teacher-student content formed together in the practice of learning mathematics with art technology through YouTube (Jubien, 2014). Postphenomenologists in learning mathematics with art technology through YouTube also question the traditional view of art technology that views that art represents a relationship with the world that always involves separation and does not affect each other (Ihde, 1995; Jubien, 2014). According to him, this view is problematic because it gives birth to a worldview that implies power relations, in which humans are subjects who control, organize and regulate the environment as objects that can be seen and consumed. The problem of art in learning mathematics with art technology through YouTube is closely related to modern education. Modern education, which explores media in general, is often thought to encapsulate a worldview that separates the subject and object as viewer and viewer. From these practical reflections, this study examines how the creator-teacher-student content relationship is formed, resulting in subjective and context-specific experiences about the mediating role of technology in the practice of learning mathematics with art technology through YouTube (Fried & Rosenberger, 2021). The results of this reflection support the post-phenomenological view, which states that learning mathematics with art technology through YouTube mediates human, cyber, and human experiences in an interactive relationship.

#### 4. CONCLUSION

The teacher's role as a learning trigger in online learning has been transitioned by digital technology, which is YouTube in the context of this research. This is explored in designing mathematics learning for elementary school students according to the essential competencies that have been determined together, which are then developed by selecting themes according to conditions and making learning media easier for students to understand learning according to their abilities. With YouTube, this exploration is done communally and cyber. This represents eco-connectivity in the interrelation between technology, psychology, and philosophy by studying the development of learning through YouTube and its contents. This provides a comprehensive interrelationship perspective, which further strengthens the role of educators and content creators as pedagogical publics, to support modern mathematics learning that develops state-of-the-art technology. This interactive relationship then forms "us" (humans). This reflection also proves the traditional landscape art technology view, which tends to separate mathematics learning and the world because of

technology. However, on the other hand, humans, art, technology, mathematics, and the world have an integrative relationship.

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