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Optimizing academic supervision through CoMent strategy in STEAM-ED approach and application of fractal geometry

Rahmad Ramelan Setia Budi^{1*)}, Rambat Nur Sasongko², Badeni Badeni², Muhammad Kristiawan²

¹Education and Culture Supervisor of Bengkulu, Indonesia

²Universitas Bengkulu, Indonesia

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ABSTRACT

This study examines the implementation of academic supervision using the CoMent Strategy of school supervisors in an effort to maximize the STEAM-ED approach and the application of fractal geometry to Batik and Textile Creative Craft instructors at State Vocational School 5 Bengkulu City. The method used was qualitative descriptive method. This research was conducted over two academic years in the academic year 2019-2020 to 2020-2021. In this study, the subjects studied were teachers in the competence of Batik & Textile Creative Crafts, totaling 8 people. The data collection in this study used testimonials in the form of learning logs and documentation. The data analysis was an interactive model of data analysis technique. The results showed that there is a high level of satisfaction in carrying out the learning process using the STEAM-ED approach and the application of fractal geometry, as well as the performance of the trained teachers. The adoption of academic supervision through the CoMent technique proved to be highly effective in maximizing the STEAM-ED approach and the use of fractal geometry for Batik and Textile Creative Craft instructors in their learning. The advantage of the CoMent strategy is that it can streamline the implementation of academic supervision of fostered teachers in an effort to provide active, effective, meaningful and fun learning for each student so that they are able to think critically, be creative, innovate, have higher order thinking skills and be creative in solving problems through coaching and mentoring assistance activities.



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Corresponding Author:

Rahmad Ramelan Setia Budi

Universitas Bengkulu

Email: rahmadsetia70@gmail.com

Introduction

Teachers, according to the Law of the Republic of Indonesia No. 14 of 2005, are professional educators whose primary responsibility is to educate, teach, guide, direct, train, assess, and enhance learning in early childhood education through formal education, basic education, and medium education. Teachers have to engage in continuous professional development and teach new knowledge. The changes in educational policies are another factor that requires the adaptation of teachers. Shortly, it can be asserted that teachers are required not only to carry out their tasks effectively but also to go beyond the job definitions. Additionally, they need to show a high level of adaptation to different and changing situations (Limon İ & Sezgin-Nartgün Ş, 2020). Also, teachers reflect on their pedagogical performance, thinking about their actions and practices, analyzing them as cultural filter to overcome the teacher professional development processes, which would be ideal for

the improvement of the practices done by teachers (Gálvez E & Milla, R, 2018). Amtu, O., Makulua K., Matital J & Pattiruhu C. M, (2020) state there is a direct or indirect influence of school culture and work motivation on student learning outcomes through teacher performance. Through teacher performance, school culture and work motivation can be encouraged and improved professionally so as to improve student learning outcomes well. According to Mailool J, Kartowagiran B, Retnowati T. H, Wening, S & Putranta H, (2020) teacher performance must be continuously updated to serve the increasing educational needs. So the teachers need to have extensive knowledge (Nursamda, 2020). Gómez and Valdés (2019) teachers picked the following characteristics are topic mastery, objective and content structuring, class organization, learning assessment, interaction qualities, and presentation quality. The students arranged the attributes in a different order. For them, the following were the most important factors: topic mastery, presentation quality, class organization, interaction characteristics, learning assessment, and structuring of objectives and contents.

All components are necessary in the field of education in Indonesia to educate the lives of the nation's children, but in fact, the emphasis and hope in education in Indonesia has shown to be particularly dependent on teachers. One of the reasons is that the teacher has direct contact with the kids in the class. Furthermore, parents, society, and the government entrust teachers to educate and teach or carry out the learning process because they believe that teachers are very important components who have the knowledge, and skills that students require in order to grow and develop optimally. As a result, it is impossible to deny that instructors are one of the most important factors in educational performance, because teachers must also be innovative, and competent. One of the most crucial teaching credentials is creativity and competency.

Teachers may process learning programs via invention and competency, and they can also carry out evaluations and administration. According to Haberin (2020), the instructional supervisor's perspective has been called into doubt. It is not sufficient to be familiar with regularly used supervisory procedures, such as how to perform classroom observations or meet with instructors and give instructional assistance. According to Gohar & Qouta, (2021), academic supervision is a multifaceted process that involves researchers, supervisors, and examiners. It faces several problems to dissertations and theses, as well as impediments to supervisors. As a result, the current study sought to identify and address these issues. According to McGhee and Stark (2021), the constructivist ethos enabled by clinical solution-focused supervision is ideal for today's educational settings because it promotes strengths, empowers classroom teachers, and strengthens the shared responsibilities of teachers and their instructional supervisors.

According to Article 39 paragraph 1 of the Law of the Republic of Indonesia No. 20 of 2003 on the National Education System, education personnel are tasked with carrying out administration, management, development, supervision, and technical services to support the education process in educational units. According to Article 15 of Law Number 20 of 2003, vocational education is secondary education that prepares students to work in specific sectors. According to the Minister of Education and Culture Regulation Number 34 of 2018 concerning National Standards for Vocational High School Education or SMK/MAK is part of the national education system with the goal of vocational education, namely to produce skilled workers who have the ability in accordance with the demands of the business world/industry, as well as being able to develop their potential in adopting and adapting to the development of science, technology, and art. Furthermore, the profile of SMK/MAK graduates in accordance with the competency standards of SMK/MAK graduates, Regulation of the Minister of Education and Culture Number 34 of 2018 concerning National Standards for Vocational High School Education or SMK/MAK are faith, piety, and noble character, have a strong mental attitude to develop themselves in a sustainable manner, mastering science, technology, and art and possessing skills according to development needs, possess productive talents in their field of competence, whether for job or entrepreneurship, and contribute to the development of a competitive Indonesian industry in the global market.

One of researchers as vocational supervisor emphasized fostering the standards of educators and education personnel during the last two academic years, namely the 2019-2020 school year and the 2020-2021 school year, because the quality of this standard achievement is still in the lowest range, with a quality value ranging from 2.05 to 3.7. (Towards National Education Standards and according to Internal Quality Assurance Standards). The conclusions of the description are based on the findings of the analysis, which show that there are still instructors who do not teach according to their educational background, and there are no laboratory employees who have the proper educational background. The availability and competency of librarians are not in conformity with the regulations, and the chief librarian lacks the necessary credentials.

Vocational High School is an educational institution that prepares future employees to be excellent and high-quality human resources. To achieve excellence and quality in the development of the education system, it is constantly developed and based on various problems based on the analysis of the quality report cards of the fostered schools above, the researcher as the school supervisor sets out to emphasize the implementation of

academic supervision through mentoring activities with the 'CoMent' or 'Coaching and Mentoring' strategy to teachers in target schools with the aim and purpose of helping teachers improve their TPCCK abilities. Learning in the current day necessitates teacher expertise in order to work with technology. In terms of adopting modern and creative classroom learning, not only pedagogical elements, but also content or material aspects, and technology, are taken into account. This indicates that the TPCCK aspect is a method of efficiently integrating complex technology in learning by focusing on three factors such as pedagogy, content, knowledge, and technology itself in learning that is established by instructors. The TPCCK paradigm implies that teaching is complicated and dynamic. The heart of TPCCK is that learning cannot be divorced from content, and content is inextricably linked to knowledge, and conveying that knowledge necessitates pedagogy, which must be helped by technology.

They have quite complex needs and challenges, especially for Batik & Textile Creative Craft teachers at the target schools of State Vocational School 5 of Bengkulu City, because this school already has a technopark and requires them to constantly improve their creativity and innovation, especially in the batik designs they produce to be of interest to various audiences. circles and, of course, sell well in the market. At the end of the 2017-2018 school year, after the researchers as vocational school supervisors conducted mentoring activities on teaching factories at State Vocational School 5 in Bengkulu City, the teachers complained about how to increase their creativity and innovation, particularly in designing modern batik that was in demand by various groups and sold well in the market. Based on the complaints of the assisted teachers, the idea of researchers serving as vocational supervisors and subject supervisors on batik and textile creative crafts emerged to teach fractal geometry to Batik and Textile Creative Craft teachers at State Vocational School 5 in Bengkulu City by packaging them in mentoring activities. The 'CoMent' model of fostering teachers by training teachers to apply the STEAM-ED learning approach combined with project-based learning with Higher Order Thinking Skill nuances for student project assignments. The objective is for the school to be able to generate creative and new batik goods based on market demands in order to meet the difficulties of 21st century skills and the industrial revolution 4.0. One of the various labels used to define the function of principal is instructional leader (Lance, 2021). The job of supporting and monitoring instruction, on the other hand, must be entrenched in every aspect of a school structure. Although participants' conceptions of supervision differed slightly, there was agreement on the value of supervision as a collaborative, democratic venture aimed at assisting instructors in enhancing teaching and fostering learning (Glanz, 2018).

Adult learning and development are receiving more attention in educational supervision, and theory and research from those fields are being adapted to assist teachers grow and develop in ways that will eventually improve their teaching and the learning of their students (Gordon, 2019). The CoMent strategy for effective academic supervision is an effort by school supervisors to streamline the implementation of academic supervision of fostered teachers in their efforts to provide active, effective, meaningful, and fun learning for each student so that they can think critically, be creative, innovate, and have high-level thinking skills. Palmeri and Peter (2019) establish an instructive mentoring protocol and receive ongoing professional development; as a result, their mentoring practices move from an evaluative to an educative orientation. Coaching is a procedure in which the coached teacher receives coaching from the school administrator in order to attain a set goal. The crucial word here is "achievement". As a coach, the school supervisor will act as an accountability partner to ensure that the coached teachers follow through on their commitments. Mentoring is a procedure in which school administrators share their expertise and skills with supported instructors who are eager to learn. The crucial phrase here is "sharing experience and expertise". The emphasis of mentoring is more on personal and career development than on attaining objectives, implying that the emphasis of mentoring is more on the professional working relationship between school supervisors and encouraged instructors than on reaching goals. In this regard, it is typically with the expertise and experience of a school administrator in such a manner that he may lead, offer tips or practical, easy recommendations as concise instructions so that other people, in this case the helped teachers, succeed in achieving what is required. as well as ideas for learning issues encountered by fostered instructors.

Learning STEAM (Science, Technology, Engineering, Arts, and Mathematics) is one of the educational breakthroughs in Indonesia that seeks to develop humans capable of creating a science and technology-based economy because STEAM students are invited to think comprehensively with problem solving patterns based on five aspects of STEAM which aims to teach students to think critically and have techniques or designs to solve problems in the world based on their mathematics and science (Wijaya et al., 2015). In response to the high demand for science and technology-based products, an education system that requires students to be creative and innovative in accordance with the curriculum objectives that are being guided and implemented is required, namely to prepare Indonesians to live as individuals and citizens who are faithful, productive, creative, innovative, affective, and capable of contributing to the life of society, nation, state, and world civilization. STEAM can be applied optimally by using the STEAM-ED (STEAM Education) learning

approach, which is a series of learning approaches integrating science, technology, engineering or engineering, art, and mathematics that focuses on problem solving capture points, involves students in mathematics and science, as well as building 21st century skills consisting of critical thinking, communication, creativity, and collaboration, implying that STEAM-ED is a type of educational application. Students will also be taught to think critically and creatively.

Fractal geometry is the study of the characteristics and behavior of fractals in mathematics. Mandelbrot created the term "fractal" in 1975, when his work "A Theory of Fractal Set" was released. The English term for fractal is fractal, while the root word for fractal is frangere, which means to fracture into irregular shards. A fractal is any form that, when its components are extended, reveals as much detail as the entire fractal section. Fractals, unlike straight lines, are difficult to draw with hand strokes. Initially, several varieties of fractals were investigated as mathematical objects. Fractal mathematical shapes include the Sierpinski triangle, Koch snowflake, Peano curve, Mandelbrot set, and Lorenz attractor. Fractals also depict many real-world things with complex geometric structures, such as clouds, mountains, turbulence, and coastlines.

Fractals, in general, are irregular (not smooth) forms that are not based on linearity, and so are not objects described by classical geometry. At different magnification levels, fractals can exhibit self-similar structures with infinite detail. A fractal may be formed in many circumstances by repeating a pattern, generally in a recursive or iterative manner. Fractals have been widely used in science, technology, and computer art to assist explain many situations that are difficult to express using standard geometry. Fractals are commonly utilized in computer graphics to generate natural and even breathtaking shapes because to their attractiveness. The presence of fractal geometry demonstrates that mathematics is not a dry and flat topic, but rather a beautiful subject capable of producing works with artistic imagery as well as great intellectual worth. Fractal geometry, as described by Barnsley (1993), a well-known specialist on fractals today, is a new language. We can explain clouds verbally in the same way that an architect may describe a home. In the context of generating modern fractal-based batik designs, it is very vital to develop traditional batik patterns via modern batik designs based on fractal beauty, such as when looking for inspiration for batik isen to be developed. Making drawings (design/prototype) of modern batik motifs by using designs from fractals that can be derived from natural fractals to fractal designs generated from computer programs or fractal geometry apps may be used to develop modern fractal-based batik patterns. Figure 1 depicts several natural fractal forms.



Figure 1. Some Examples of Motives, Designs and Natural Fractal Shapes

Figure 2 depicts several examples of fractal patterns generated by computer algorithms or fractal geometry applications.

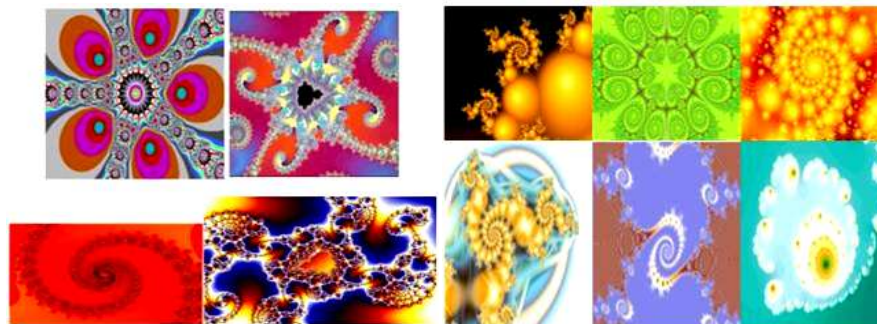


Figure 2. Some Examples of Fractal Design Forms Developed from Computer Programs or Fractal Geometry Applications

The Kfract computer application program may be used to create fractals. The KFract program is a fractal generator included with the KDE desktop (K Desktop Environment). The updated KDE version can create mandelbrot and julia sets. Mandelbrot Explorer is utilized in this study report, which can be acquired from the Mandelbrot Application Play Store, Defiant Technologies, LLC via android or smartphone, and fractal design picture sources from many sources. Figure 3 shows a picture of the Mandelbrot Sets and Julia Sets from KFract.

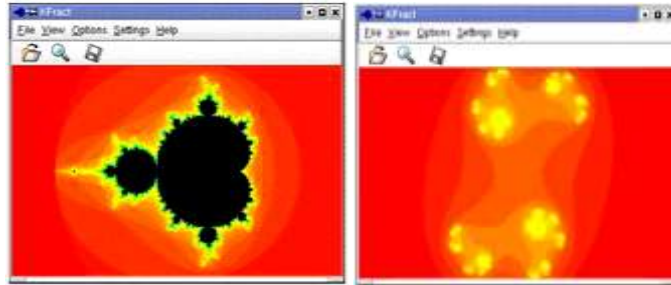


Figure 3. Sample Images of Mandelbrot Sets and Julia Sets from Kfract

Here are some images of fractal pattern formation using the Mandelbrot fractal tool.

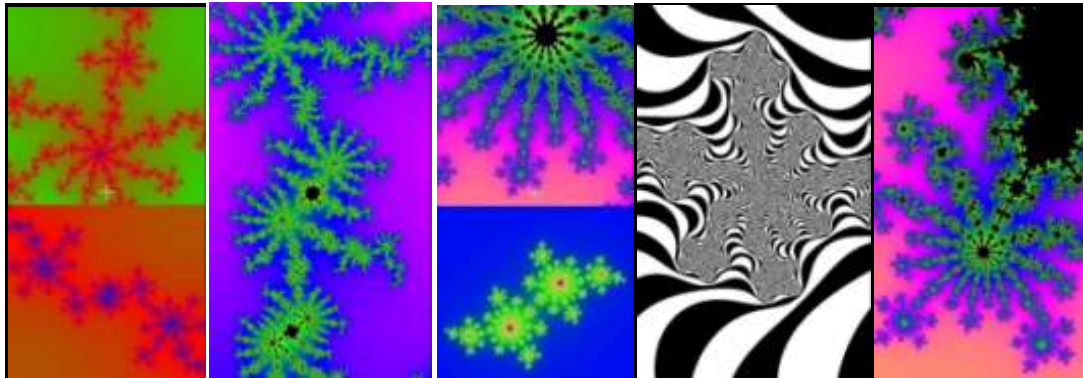


Figure 4. Sample Image of the Development of a Parented Fractal Pattern from Mandelbrot Fractal App

The novelty in this research is the implementation of academic supervision of fostered teachers by school supervisors through a combination of two techniques, namely coaching and mentoring (CoMent) in teaching teachers to design 'batik besurek' designs through the application of geometric fractal applications with STEAM-ED approach to enrich batik motifs, patterns and colors in batik production and textiles to meet the consumer market through the development of teaching factories in schools.

Method

The researchers employed a qualitative descriptive technique to investigate the topic in this study, which means that all field results that are closely relevant to the problems addressed are reported in line with reality, are not made up, and will then be examined using a qualitative approach. According to Denzin and Lincoln in Moleong (2007), qualitative research is study that is conducted in a natural context with the goal of analyzing events that occur and is carried out using a variety of current methodologies. According to Bungin (2005), qualitative research is the major part of research design in the framework of a qualitative descriptive approach, which comprises the research context, study focus, research objectives, research scope and setting, theoretical viewpoint, and literature evaluation. Qualitative research is a type of research that aims to interpret and or understand a phenomenon or symptom regarding what is experienced by the research subject which can be from behavior, perception, action, encouragement, interest, and so forth thoroughly and by describing it in the form of words or a series of sentences or language in certain natural or natural contexts that still pay attention to the rules of scientific thinking. The research location is State Vocational School 5 Bengkulu City. This school was chosen as the research location on the grounds that this school is located in Bengkulu City where the researcher works and is the only school in Bengkulu province that has the competency of Batik & Textile Creative Crafts.

In this study, we employed testimonies in the form of learning logs (free expressions) and documentation to collect data. In this study, a voice and picture recording equipment was also employed, as well as a high-resolution mobile phone for both sound quality and image capture. Given that the main tool is the researcher himself, the researcher will make frequent and repeated visits to the field or study area. The technique for determining the validity of the data gathered has been carried out by repeating numerous observations or observations at the study site, focused group discussions, thorough interviews from testimonies through learning log entries, and documentation. The researcher's data analysis approach in this study is based on the analytical model proposed by Miles and Huberman (1984). This model's data analysis approach consists of four interconnected components: data gathering, data reduction, data display, and drawing conclusions and verification. If the conclusion is still judged unsuitable, the researcher returns to the field to gather data, and so on, creating a cycle.

Results and Discussions

Optimizing academic supervision at State Vocational School 5 Bengkulu City is based on data from the implementation of the CoMent strategy of school supervisors as researchers in teacher guidance and training activities using the STEAM-ED approach and the application of fractal geometry in an effort to strengthen thinking abilities and skills to a higher level or Higher Order Thinking Skills (HOTS) of teachers on the competence of Batik & Textile Creative Crafts at the school.

Optimizing academic supervision, particularly in the implementation of academic supervision with the CoMent strategy of school supervisors in an effort to optimize the STEAM-ED approach and the use of fractal geometry to strengthen ability and thinking skills to a higher level or Higher Order Thinking Skill (HOTS). It fostered teachers at Kriya Kreatif Batik and Textiles at State Vocational School 5 of Bengkulu City are monitored based on the results of individual reports from school supervisors in carrying out academic supervision and in-depth interviews after mentoring and training activities, as well as testimonials through learning logs to every teacher in charge of vocational creative batik and textiles in this study regarding satisfaction through messages and impressions of students. The purpose of the triangulation discussion between the assisted teachers as research subjects and the school principal is to equalize the perception of whether each material content in the CoMent activity is in the form of STEAM-ED approach material and the application of fractal geometry to learning carried out by Batik and Textile Creative Craft teachers at State Vocational School 5 of Bengkulu City that have been prepared and developed in accordance with the objectives of the expected academic supervision activities.

Based on the results of individual reports of school supervisors in carrying out academic supervision and in-depth interviews after mentoring and training activities, as well as testimonials through learning logs to every teacher in charge of vocational batik and textile creative crafts who are the subject of this research, and based on the results of an empirical study in the implementation of Academic Supervision with the CoMent strategy of school supervisors through the application of STEAM-ED with the application of fractal geometry to strengthen thinking abilities and skills to a higher level or Higher Order Thinking Skill (HOTS) for Batik & Textile Creative Craft teachers at State Vocational School 5 of Bengkulu City. It was discovered that the teacher's ability to absorb material about fractal geometry and its application for the development of motifs, designs, and forms of modern batik besurek, as well as the application of learning with the STEAM-ED educational approach with the application of fractal geometry, and the level of satisfaction through impressions and messages.

The form of the 'CoMent' strategy activity in the implementation of academic supervision is in the form of coaching and mentoring activities in the implementation of planned and periodic coaching and mentoring in two school years carried out by school supervisors to fostered teachers at a meeting of teachers of productive batik and school textile subjects who are members of the 'CoMent' strategy. a group of teachers of batik and textile expertise on the application of fractal geometry with the STEAM-ED approach to the production process of 'batik besurek'. This production process activity starts from designing besurek batik in terms of design, color selection and determining the pattern so that the besurek batik produced or produced can attract the attention of consumers, meaning that the products sell well and are successful in the consumer market that reaches all levels of society and industrial partners in Bengkulu and outside Bengkulu.

The lessons, patterns, and strategies for fostering school supervisors as subject supervisors in this skill competency, particularly in the guidance and training activities that have been implemented, have shown significant progress and satisfaction for the fostered teachers, as indicated by indicators of achievement of monitoring and evaluation results through daily reports on the implementation of academic supervision as indicated in tables 1 and 2, below.

Table 1. Innovation Products Developed by Product Type in Technopark Development of Batik and Textile Creative Craft Expertise Packages at State Vocational School 5 of Bengkulu City for the 2019-2020 Academic Year

No	Product Name	Reasons for Choosing Featured Products	Implementation	Process
1	The basic material for patterned clothes is 2.5M. (Fractal-based Modern Design Batik or Besurek Plus / contemporary)	To introduce and provide a more varied design development, for example the production of hand-drawn batik with modern fractal-based batik ornaments	Early August 2019 - Now	<ol style="list-style-type: none"> 1. Preparation of batik tools and materials 2. Creating a modern fractal-based or Besurek Plus/contemporary batik design. 3. Transferring the design to the fabric 4. Insertion process 5. Coloring process 6. Pelorodan process 7. Finishing
2	The basic material of the shirt is not patterned, the size is 2.25M. (Fractal-based Modern Design Batik or Besurek Plus / contemporary)	To introduce and provide a more varied design development, for example the production of hand-drawn batik with modern fractal-based batik ornaments	Early August 2019 - Now	<ol style="list-style-type: none"> 1. Preparation of batik tools and materials 2. Creating a modern fractal-based or Besurek Plus/contemporary batik design. 3. Transferring the design to the fabric 4. Insertion process 5. Coloring process 6. Pelorodan process 7. Finishing
3	Pashmina Handmade batik	Because these products are very much in demand by consumers	Early August 2019 - Now	<ol style="list-style-type: none"> 1. Preparation of batik tools and materials 2. Creating a modern fractal-based or Besurek Plus/contemporary batik design. 3. Transferring the design to the fabric 4. Insertion process 5. Coloring process 6. Pelorodan process 7. Finishing
4	Scarf Handmade batik	Because these products are very much in demand by consumers	Early August 2019 - Now	<ol style="list-style-type: none"> 1. Preparation of batik tools and materials 2. Creating a modern fractal-based or Besurek Plus/contemporary batik design. 3. Transferring the design to the fabric 4. Insertion process 5. Coloring process 6. Pelorodan process 7. Finishing

Table 2. Innovation Products Developed by Type of Marketing in Technopark Development of Batik and Textile Creative Craft Expertise Packages at State Vocational School 5 of Bengkulu City for the 2019-2020 Academic Year

No	Product Name	Materials	Selling Price	Marketing Place	Marketing Type	Number of Products
1	The basic material for patterned clothes is 2.5M. (Fractal-based Modern Design Batik or Besurek Plus / contemporary)	Primisima	Rp.600.000,00 - Rp.1.000.000,00	Gallery, Exhibition, Online, Dekranasda, Souvenir Center	1. Direct Selling 2. Indirect Selling (via internet)	6 Pieces
2	The basic material of the shirt is not patterned, the size is 2.25M. (Fractal-based Modern Design Batik or Besurek Plus / contemporary)	Primisima	Rp.450.000,00 - Rp.800.000,00	Gallery, Exhibition, Online, Dekranasda, Souvenir Center	1. Direct Selling 2. Indirect Selling (via internet)	28 Pieces
3	Pashmina Handmade batik	Paris cotton	Rp.200.000,00	Gallery, Exhibition, Online, Dekranasda, Souvenir Center	1. Direct Selling 2. Indirect Selling (via internet)	14 Pieces
4	Scarf Handmade batik	Primisima	Rp. 50.000,00	Gallery, Exhibition, Online, Dekranasda, Souvenir Center	1. Direct Selling 2. Indirect Selling (via internet)	26 Pieces

Based on the results of data collection in in-depth interviews with various sources collected in this study are: "Through this interview, I have captured very well the message of fractal learning with STEAM-ED approach through coaching and mentoring activities. Fractal learning for me is still new in an effort to improve the besurek batik isen ornaments that I give to students, and of course besides getting other inspiration in designing besurek batik. I really enjoy learning fractals and try to continue to apply them in designing or designing batik besurek with my colleagues and of course with my students" (Hotpita Danken Sitorus, teaching in class XII KKBT); "After I observed that fractal lessons were very important for me in an effort to improve the besurek batik isen ornaments that I had practiced with my students. Besides getting my inspiration in looking for colors and guides as well as the shape of the ornaments to decorate batik besurek. I am very impressed with learning fractals with STEAM-ED approach and God willing, it will be applied in designing and designing with my colleagues and students. The results of batik inspired by fractals were really very satisfying and proud of me and it was even more memorable when some guests from outside the region who came to the school of teaching factory of State Vocational School 5 Bengkulu City were really interested and bought them as valuable souvenirs" (Hasnawati, teaching in class XI KKBT); "Through this interview about the coaching and training that Mr. Rahmad Ramelan Setia Budi has carried out, especially in coaching and mentoring activities for all my teachers in batik and textile expertise, it was very impressive, especially when coaching and mentoring activities for fractal learning have been given several times since 2015. 2019/2020 ago and now in 2020/2021. Thank you sir for the guidance so far. My message and hope is that you will always provide guidance and continue to guide us in carrying out our duties and functions as teachers and continue to inspire all of us" (Rismaiti, Principal); "Mr. Rahmad Ramelan Setia Budi, as a supervisor on productive subjects in the creative craft of batik and textiles, Mr. Rahmad gave a lot of input in the implementation of learning, starting from making learning tools to how a teacher does self-development in accordance with the

competencies being taught. Every time we come to school, we always provide guidance in the form of coaching and mentoring, as well as motivation for us to be passionate about providing knowledge to students" (Rini Kuswati, teaches in class XI KKBt); "In several meetings, to be honest I was very interested in observing and studying fractals packaged in this coaching and mentoring activity because the delivery method from Mr. Rahmad Ramelan Setia Budi as our supervisor supervisor was very interested in learning and the delivery of the material was very clear using the fractal application. Learning fractals with STEAM-ED approach for me is very important in an effort to improve the besurek batik isen-isen ornaments that I teach to my students. In addition to gaining new knowledge, I also get other inspiration in designing the besurek batik that I teach to my students. In addition to gaining new knowledge, I also get inspiration in finding colors and guides, as well as the shape of the besurek batik ornaments. I try to apply it with my colleagues and of course with the students.

The results of batik with designs from fractals really make me proud and I am impressed when guests who come from outside the area come to the Teaching Factory (TeFa) gallery of State Vocational School 5 Bengkulu City. They were very interested and bought it as a souvenir to bring to their area" (Endang Warsini, teaching in class XII KKBt); "Mr. Rahmad has explained the material about fractals which turns out to be fractals that can be broken down into several parts, all of which are similar to the original fractal with STEAM-ED approach. I was very amazed and very interested after seeing a fractal which turned out to be a fractal that could be broken down into several parts, all of which are similar to the original fractal. I was also very amazed and very interested after seeing the fractal itself where after I saw through the application with various examples of fractal images shown by Mr. Rahmad the design shape and color were very interesting to be applied to making designs in this batik competency by making the fractal become isen-isen ornaments on besurek batik so that it can be applied to students so that students are able to be more creative in making besurek batik designs into more varied besurek batiks. With the existence of this fractal, it will turn into a besurek batik color at State Vocational School 5 Bengkulu City so that it can attract consumers at home and abroad". (Ayu Fitri Handayani, teaching in class X KKBt); "The fractal lessons with STEAM-ED approach taught by Mr. Rahmad Ramelan Setia Budi are really interesting and inspiring. The fractal design is a distorted image of an object or objects (distilled in such a way into various rich organic shapes with a choice of color variations). Fractal learning can be used as a medium for teaching teachers and student learning, inspiring and can be applied to the competence of batik and textile creative craft design skills, especially batik subjects. Hopefully learning using fractal applications will develop and excel specifically in Besurek batik designs. The results of fractal motif batik products displayed in the TeFa gallery of State Vocational School 5 Bengkulu City are in great demand and purchased by visitors who come from outside the region as valuable souvenirs and have high artistic value" (Lili Heryanti, teaches in class X DPKK & Dressing, XI KKBt, and XII KKBt & AKL); "Fractal learning by Mr. Rahmad Ramelan Setia Budi delivered through coaching and mentoring, is very good to be applied to image learning, now it's just a matter of developing it and which part you want. We just have to determine and there will be a lot of learning from this fractal system with STEAM-ED approach that we can pick up such as its shape, color, and rhythm, as well as its unity. So I say that fractal learning can be applied to practical learning in our place, especially batik in the batik and textile department at our school" (Yunizah, teaches in class X and XI KKBt), and; "About the practice of fractals applied to Bengkulu besurek batik, I am very grateful and grateful because the knowledge that Mr. Rahmad gave was new to me, plus what Mr. Rahmad had taught me about learning media using Android directly in the Teknopark room really added to my knowledge in this field. especially in the field of fractals, especially as a batik teacher in class XI. Through this interview, I sincerely hope that Mr. Rahmad Ramelan Setia Budi will not tire of imparting his knowledge to us, especially in the batik and textile craft department at State Vocational School 5 Bengkulu City and we do not refuse if there is any new knowledge that you get given to us teachers at environment of SMK Negeri 5 Bengkulu City. Let us also be smarter in teaching our students" (Rante Malem Ginting, teaching in class XI KKBt).

Based on the findings of in-depth interviews conducted following mentoring and training activities with the CoMent strategy on the implementation of academic supervision, learning impressions and messages, and the supervision patterns and strategies used by school supervisors through the learning logs of fostered teachers, and on the findings of teachers' complaints about a lack of inspiration for developing motives, designs, and forms of modern batik based on This has undoubtedly addressed the major issue in this research, which has been written about and commented on.

The development of modern batik motifs, designs, and forms, particularly batik besurek plus with fractals, packaged in the implementation of academic supervision of school supervisors with the CoMent strategy in the learning process with the STEAM-ED educational approach and the application of fractal geometry to fostered teachers at Batik & Textile Creative Crafts at State Vocational School 5 of Bengkulu City, has also succeeded in supporting the development of the 'Teaching Factory' or 'TeFa' and at the same time enriching

modern besurek batik products based on fractal beauty at the Technopark in schools. Almost no significant problems were discovered during the implementation of the CoMent strategy through the application of STEAM-ED with the application of fractal geometry, and even if there were, they were not critical problems and solutions could be found immediately, such as the limitations of teachers in applying technology in searching for fractal design literature in designing batik lesson plans. Furthermore, the school supervisor or peer instructor quickly assists with fractal geometry programs that are simple to download via an Android phone or smartphone and offer instructions/how to use them. Thus, academic supervision with the CoMent strategy of school supervisors was able to optimize the implementation of academic supervision of school supervisors who also served as subject supervisors by applying STEAM-ED with the application of fractal geometry to Batik & Textile Creative Craft teachers at State Vocational School 5 of Bengkulu City.

Conclusions

Academic supervision with the CoMent strategy of school supervisors was able to optimize academic supervision implementation through the application of STEAM-ED with the application of fractal geometry to strengthen thinking abilities and skills to a higher level or Higher Order Thinking Skills (HOTS) to Batik & Textile Creative Craft teachers at State Vocational School 5 of Bengkulu City. The results of this study can provide input regarding the implementation of academic supervision not only to school supervisors who are indeed their duties and functions but also to school principals in any educational unit regarding implementing coaching and mentoring in carrying out their duties, especially in providing coaching and mentoring. Meanwhile, fractal geometry learning that has been successfully applied in obtaining design inspiration, patterns and colors of 'batik besurek' can also provide input to batik craftsmen or producers of batik besurek in Bengkulu and surrounding areas to produce isen-isen of batik which is richer in color, pattern and design to make it more attractive and beautifully attracting individual users or consumers, home industries and even all industrial partners.

References

- Amtu, O., Makulua, K., Matital, J., & Pattiruhu, C. M. (2020). Improving Student Learning Outcomes through School Culture, Work Motivation and Teacher Performance. *International Journal of Instruction*, 13(4), 885-902. <https://doi.org/10.29333/iji.2020.13454a>
- Barnsley, M. F. (1993). *Fractal Everywhere*. Academic Press Professional. United States of America.
- Bungin, B. (2005). *Analisis Data Penelitian Kualitatif, Pemahaman Filosofi dan Metodologis ke Arah Penguasaan Metode Aplikasi*. Jakarta: Raja Grafindo Persada.
- Gálvez, E. & Milla, R. (2018). Teaching Performance Evaluation: Preparation for Student Learning within the Framework for Teacher Good Performance. *Propósitos y Representaciones*, 6(2), 407-452. doi: <http://dx.doi.org/10.20511/pyr2018.v6n2.236>
- Glanz, J. (2018). Chronicling Perspectives about the State of Instructional Supervision by Eight Prominent Scholars of Supervision. *Journal of Educational Supervision*, 1 (1). <https://doi.org/10.31045/jes.1.1.1>
- Gohar, A. S., & Qouta, M. M. (2021). Challenges of Improving the Quality of Academic Supervision of Post graduate Studies at the Faculty of Education, Damietta University. *Journal of Educational Issues*, ISSN 2377-2263, 2021, Vol. 7, No. 1. <https://doi.org/10.5296/jei.v7i1.18292>
- Gómez L F., & Valdés, M. G. (2019). The Evaluation of Teacher Performance in Higher Education. *Propósitos y Representaciones*, 7(2), 479-515. <http://dx.doi.org/10.20511/pyr2019.v7n2.255>
- Gordon, S. P. (2019). Educational Supervision: Reflections on Its Past, Present, and Future. *Journal of Educational Supervision*, 2 (2). <https://doi.org/https://doi.org/10.31045/jes.2.2.3>
- Haberlin, S. (2020). Mindfulness-Based Supervision: Awakening to New Possibilities. *Journal of Educational Supervision*, 3 (3). <https://doi.org/10.31045/jes.3.3.6>
- Lance, T. (2021). Chasing Down the Educational Debt by Centering Race in Educational Supervision. *Journal of Educational Supervision*, 4 (1). <https://doi.org/10.31045/jes.4.1.2>
- Law of the Republic of Indonesia No. 20 of 2003.
- Limon, İ., & Sezgin-Nartgün, Ş. (2020). Development of teacher job performance scale and determining teachers' job performance level. *Kuramsal Eğitim Bilim Dergisi Journal of Theoretical Educational Science*, 13(3), 564-590, <http://dx.doi.org/10.30831/akukeg.642340>
- Mailool, J., Kartowagiran, B., Retnowati, T. H., Wening, S., & Putranta, H. (2020). The effects of principal's decision-making, organizational commitment and school climate on teacher performance in vocational high school based on teacher perceptions. *European Journal of Educational Research*, 9(4), 1675-1687. <https://doi.org/10.12973/eu-jer.9.4.1675>

- McGhee, M. W., & Stark, M. D. (2021). Empowering Teachers Through Instructional Supervision: Using Solution Focused Strategies in a Leadership Preparation Program. *Journal of Educational Supervision*, 4 (1). <https://doi.org/10.31045/jes.4.1.5>
- Miles, B. M., & Huberman, A. M. 1984. *Qualitative Data Analysis*. BeverlyHills, CA: sage Publication.
- Minister of Education and Culture Regulation Number 34 of 2018 concerning National Standards for Vocational High School Education or SMK/MAK
- Moleong, L. J. (2007). *Metodologi Penelitian Kualitatif [Qualitative Research Methodology]*. Bandung: Remaja Rosdakarya.
- Nursamda, N. (2020). Peningkatkan Kompetensi Guru Kelas dalam Melaksanakan Pembelajaran Melalui Metode Peer Teaching pada Kelompok Kerja Guru (KKG) SD Negeri 44 Rampoang Palopo. *Publikasi Pendidikan*, 10(2), 177. <https://doi.org/10.26858/publikan.v10i2.13511>
- Palmeri, A. B., & Peter, J. A. (2019). Conflated Constructs: Disentangling the Educative and Evaluative Functions of Preservice Teacher Supervision. *Journal of Educational Supervision*, 2 (2). <https://doi.org/10.31045/jes.2.2.5>
- Wijaya, A. D., Dina, K., & Amalia. (2015). Implementasi Pembelajaran Berbasis STEAM (Science, Technology, Engineering, Art, Mathematics) Pada Kurikulum Indonesia [Implementation of STEAM-Based Learning (Science, Technology, Engineering, Art, Mathematics) in the Indonesian Curriculum]. *Seminar Nasional Fisika Dan Aplikasinya, November*, 85–88. http://portal.phys.unpad.ac.id/senfa2015/proseding/FP-09_Agusta_Danang.pdf