Wastepreneurship: A Model in Improving Students' Confidence and Creativity

Abstract: Skill in processing waste is an essential attitude needed in daily life because environmental pollution issue is one of the important parts that are learned in science subject. It is required students' self-confidence and creativity in processing waste into a useful product. This research aims to improve students' confidence and creativity through science wastepreneurship learning model. This research used experimental non-equivalent control group design. Total of the samples were 140 students who were divided into experiment group (n = 75) and control group (n = 65). Statistic data analysis was carried out through One-way ANOVA in significance level of 0.05. This research showed that the self-confidence and creativity of students on posttest finding in experiment group is higher than control group. It can be concluded that science wastepreneurship learning model was effective in improving students' confidence and creativity in processing waste. Therefore, science wastepreneurship learning model is suggested to be more often used by the teachers in Junior High School.

Keywords: *Science wastepreneurship, creativity, self-confidence, waste processing*

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Introduction

Science learning process must become meaningful and useful experience for students to develop ability in solving daily life problems, especially household waste that causes environmental pollution issues. Students' awareness and knowledge toward how to process waste are still low in eco-school and noneco-school (Riastini, 2019; Wulandari & Sulistiowati, 2017). Students' critical thinking ability needs to be trained for more creative in managing various types of household waste (Agommuoh & Ndrika, 2017). Hence, students need to be trained on their creativity and innovation in managing household waste. Creation and innovation abilities are important aspects to be developed in 21st century competition (Martin & Iucu, 2013; Trilling & Fadel, 2009).

Various ways can be done in science learning process in the school to train students' ability in processing waste. For instance, recycling organic waste, reducing the use of material that is hard to be decomposed, reusing used goods for other function (Emilie, 2015). Some studies recommends how to teach students in managing waste at school, which is by integrating it into learning process in the classroom or outside the class along with outside party (Desa et al., 2012; Khafid, 2019; Mahat, 2016). Through integrated learning process, the students will actively strive for themselves (Huda & Dewi, 2012; Patonah et al., 2018). Waste that is well managed, for example it is made into art product and handicraft, the products can be sold for extra financial income (Broom, 2019; Okori & Ebere, 2019). This shows that entrepreneurship values can be obtained along with the effort in reducing environmental pollution.

Recommendation of some studies is that entrepreneurship needs to be a part of science learning (Achor & Wilfred Bonse, 2013; Deveci & Cepni, 2017; Elo & Kurten, 2019; Hilario, 2015; Nwakaego & Kabiru, 2015;). Recommendation given refers to the importance of entrepreneurship value that is taught in an integrated way with various lesson, however, it is

still constrained by teachers' ability in using appropriate method, approach, and also strategy. Teachers need to be trained in integrated entrepreneurship with the subjects taught (Okori & Ebere, 2019).

The advantages gained from integrating waste management activity with entrepreneurship principle are: students will have character with innovative, creative, persistent, confidence, patient, curious, risk taker, optimist, realistic, hardworking, strengthen mental become reliable worker, and care for the environment (Agomuoh & Ndirika, 2017; Gonghua Li, 2017; Huda & Dewi, 2012).

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Science wastepreneurship learning model is required to train an entrepreneurship spirit and ability in overcoming the environmental pollution. The principle of science wastepreneurship learning model emphasizes the process of learning together in groups so that the discussion process occurs, and students are given the freedom to be creative in making useful products from waste (Sheldrake, 2016; Yang, 2016). Therefore creativity and self-confidence is a primary skill that can be developed through science wastepreneurship learning model. Exercise and learning process carried out by students is expected will give impact to better creativity and self-confidence than before. Therefore, this research will prove the influence of science wastepreneurship learning model toward students' confidence and creativity in processing waste.

Literature Review

Science learning integration with entrepreneur activity is formulated in science wastepreneurship learning model. The integration of entrepreneurship education into other subjects is a concern in Western countries (Elo & Kurten, 2019). It aims to connect the usefulness of knowledge gained by students at school when at home. The benefits obtained are not only scientific aspects, but are able to utilize entrepreneurship education through science lessons (Deveci & Cepni, 2017; Huda & Dewi, 2012). Non-business majors students

are very interested in participating in entrepreneurship training because they are interested in the benefits and success gained through learning entrepreneurship (Mani, 2015).

The science learning process that is integrated with entrepreneurship requires a special design so as not to eliminate the essence of the object of science learning. Learning designs need to be tested so that science teachers are easy and directed to teach students. According to Joyce and Weil (1980) learning model consists of five components, which are: (1) syntax, (2) reaction principle, (3) social system, (4) supporting system, and (5) instructional and nurturant impact. Syntax is sequence of learning steps conducted by teacher. Reaction principle is a principle in performing action in the form of freedom of thinking and taking action. Social system is social rule that is applicable with teacher as the mediator and motivator, and also student as learning process actor. Supporting system is in the form of learning facilities such as: garbage bin, used can, compost making equipment, etc. Impact is consequence obtained from learning process.

Science wastepreneurship learning process is designed in order the students are able to utilize household waste to be processed into entrepreneurial products. Waste management conducted in wastepreneurship learning model applies 3R principles (reduce, reuse, and recycle). Reduce means to reduce the potential for increasing waste, reuse means to reuse useful waste, and recycle means to recycle waste into useful product (Deveci & Cepni, 2017; Potluri & Phani, 2018). Reduce, reuse, and recycle (3R) principles of waste management can be conducted easily by students at home, both for children and teenage level or adult level (Mahat, 2016; Martin & Iucu, 2013). Learning activity is more emphasized on students' freedom to create products and confidence in making and presenting the products as entrepreneurial products.

Some studies show that there is relation between learning project with creativity improvement (Anazifa & Djukri, 2017; El-Batri et al., 2019; Suwarno et al., 2019). Projects activities need to be designed flexibly and give freedom for students to create. Students' creativity will not

occur if teacher is too fixated with curriculum administration affair, and there is unsupportive learning environment (Beetlestone, 2013; Runco et al., 2017; Yang, 2016).

Confidence is formed through the process of practice and learning. Confident will encourage action that is more convincing and full of responsible in re-doing the action that had been learnt (Asiyah et al., 2019; Liu et al., 2019). Confidence also develops in collaborative learning process (Nurhayati et al, 2017). Confidence will encourage students to perform the same positive deeds in the different place and time after occurring learning and exercise process together. In addition, confidence is influenced by the usefulness of the knowledge being learned. Cox (2018) advice if we want to create learning atmosphere that encourage the students' confidence then, (a) teacher needs to create challenging learning atmosphere by giving freedom to select their best achievement students want to achieve, (b) ask students to predict how long time they need to finish their target. This time commitment can help teacher to know students' confidence in completing an assignment.

Methodology

Research Design

This research was quasi-experimental research pretest and posttest control group design. Treatment was given in two groups of students, experimental and control group. Students in experimental group were taught with science wastepreneurship learning model, meanwhile students in control group were taught by conventional learning model. Quasi-experimental design is presented on table 1.

Table 1. Quasi-Experimental Research Design

Group	**Pre-test**	**Treatment**	**Post-test**
Experiment	Creativity	Science wastepreneurship learning model	Creativity
	Self-Confidence		Self-Confidence
Control	Creativity	Conventional learning model	Creativity
	Self-Confidence		Self-Confidence

Lesson material taught was environmental pollution topic, but through different learning design on each group. Learning model in experiment and control group is presented on table 2.

Table 2. The Differences of Science Wastepreneurship Learning Model and Conventional Model

Science wastepreneurship Model	**Conventional Model**
Problem Stimulation: Observing on waste pollution picture and video	*Introduction*: Addressing learning objective and target
Organizing students to learn and formulate action plan: Deepening concept and planning creativity product of wasted targeted	*Explaining concept*: Presenting lesson material by teacher and discussion
Designing product: Process of making product	*Making product*: Teacher assigns students to make product from waste raw material
Assessing product: Students assess product quality using SWOT identification	*Collecting product*: Teacher assessing students' product
Reflection process: Students' self-evaluation on usefulness of learning outcomes	*Evaluation*: Giving cognitive test

Research Sample

The sample was 140 students of class VII in MTsN 3 Mataram that were randomly selected. All of the samples were divided into experiment group was as much as 75 students and control group was as much as 65 students. All of the students treated as research sample have the same learning background ability, were not divided based on grade or achievement, all of them were assumed with the same condition. Both of the groups were taught with the same lesson material, which was environmental pollution issue, but using different learning design. Experiment group students learned using science wastepreneurship learning model and control group learned using conventional learning model.

Validity and Reliability

After science wastepreneurship learning model was designed, later on learning model was validated by three science learning model experts. Component validated include: (1) syntax, (2) reaction principle, (3) social system, (4) supporting system, and (5) instructional and nurturant impact. Validation was conducted by assessing construction and content of learning model, and learning process sequence accuracy.

Data finding of learning model validation experts was analyzed descriptively on each component and item in the form of assessment: very good (4 score), good (3 score), poor (2 score), and very poor (1 score). Learning model was stated valid if every component was gained average score of ≥3 (Prasetyo, 2012). Expert validation finding was gained average score of 3.6 with a little revision in every model component.

Research instrument in the form of creativity and self-confidence questionnaire was using *Likert* scale. Instrument was developed based on expert theory, so it was formulated component and indicator as what is presented on table 3 and 4. Instrument was stated valid if the was $r_{observed}$ value >0.36 and instrument was stated reliable if it has reliability coefficient of ≥0.75 (Rainsch, 2004).

Table 3. Creativity Indicator in Waste Processing

Aspect	**Indicator**
Flexible thinking	Expressing various ideas in waste processing
Original thinking	Finding new various combination in waste processing
Elaborative thinking	Delivering working steps in processing waste
Evaluative thinking	Assessing advantage and disadvantage of product made
Curiosity	Eager to find ways to utilize waste
Imaginative thinking	Thinking of new ways that has not ever been made before
Feels challenged	Fond of challenges and difficulties

Based on empirical test, it was gained 15 valid items and 3 invalid items because value of $r_{observed}$ <0.36. Invalid items were not used in this research. As for creativity instrument reliability was gained 0.79 score. Thus, creativity instrument were valid and reliable.

Table 4. Self-Confidence Indicator in Waste Managing

Aspect	Indicator
Confidence in self-ability	Did not hesitate in processing waste
Optimist	Felt confident that can make product from waste
Rational	Asked reason before took action
Objective	Saw things as it was
Responsible	Conducted what had been planned
Courage to act	Dared to try

Based on empirical test, it was obtained 13 valid items and 2 invalid items because value of $r_{observed}$ <0.36. Invalid items were not used in the research. Reliability measurement finding gained 0.81 value, which means reliable because its value was >0.75. Thus, self-confidence instrument was stated valid and reliable.

Data Analysis

Before conducting ANOVA One-Way inferential statistical analysis, it carried out normality and homogeneity data test first. Normality was using Kolmogorov Smirnov test, while homogeneity was using Levene's test. Data was stated normal by Kolmogorov Smirnov if p-value was >0.05. Based on Kolmogorov Smirnov statistic test result, it was gained that all data were normally distributed (p >0.05), as what is shown in table 5.

Table 5. Kolmogorov-Smirnov Test Result

Independent Variable	Group	Data Source	Mean	Kolmogorov-Smirnov		
				Statistic	df	p-value
Creativity	Experiment	Pretest	32.15	0.097	75	0.077
		Posttest	45.75	0.090	75	0.200
	Control	Pretest	30.52	0.098	65	0.200
		Posttest	39.40	0.085	65	0200
Self-confidence	Experiment	Pretest	33.88	0.094	75	0.095
		Posttest	40.40	0.98	75	0.071
	Control	Pretest	32.91	0.099	65	0.192
		Posttest	36.28	0.94	65	0.200

Homogeneity test was required for the data that was normal characteristic in parametric statistic test (Johnson & Bhattacharyya, 2010). Data was stated homogeny by Levene's test if p-value was >0.05. Levene's test result showed that all of the data are homogeny, which means that data in every group had similarity character.

Table 6. Levene's Test Result

Variables	Groups	Levene Statistic	p-value
Creativity	Experiment and control class pretest	2.019	0.158
	Experiment and control class Posttest	2.695	0.101
Self-confidence	Experiment and control class pretest	0.527	0.469
	Experiment and control class Posttest	2.608	0.109

Statistical analysis requirement through ANOVA has been fulfilled, which data had been distributed normally and homogeneity. Later on one-way Anava test can be done to test the differences in pretest and posttest average between experiment class and control class.

Results

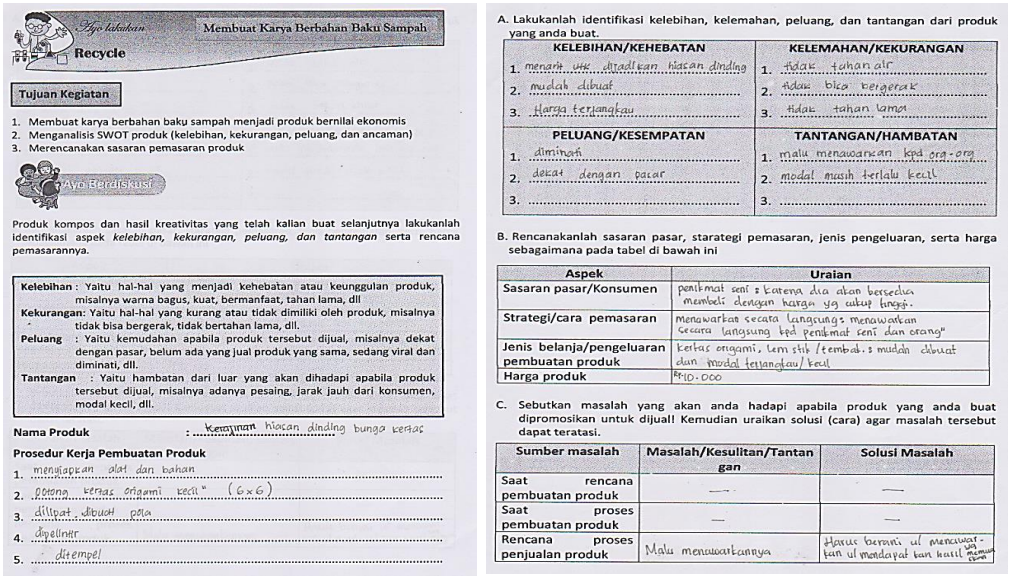
Science Learning Activity Through Science Wastepreneurship Learning Model

Science learning activity was started by teacher presented image and video of waste pollution condition occurred in nearby environment, while ask for students' comment and responses. Students were asked to make plan in effort to decrease waste pollution through utilizing garbage that was usually found in daily life. Students were given freedom to determine their type of product they want to make.

Products made by students were in form of solid or liquid compose fertilizer, handicraft from plastic and paper, handicraft from patchwork, handicraft from plastic bottle and can, handicraft from wood, etc.

Figure 1. Students Made Product from Waste

Products that had been made then was assessed through SWOT identification (Strengths, Weaknesses, Opportunities, Threats) by students as worksheet on figure 2. The worksheet contained guideline to identify the strength and weakness from product made and also identified the opportunity and threat of product marketing process conducted.



Ayo lakukan

Membuat Karya Berbahan Baku Sampah

Recycle

Tujuan Kegiatan

1. Membuat karya berbahan baku sampah menjadi produk bernilai ekonomis
2. Menganalisis SWOT produk (kelebihan, kekurangan, peluang, dan ancaman)
3. Merencanakan sasaran pemasaran produk

Ayo Berdiskusi

Produk kompos dan hasil kreativitas yang telah kallan buat selanjutnya lakukanlah identifikasi aspek *kelebihan, kekurangan, peluang, dan tantangan* serta rencana pemasarannya.

Kelebihan : Yaitu hal-hal yang menjadi kehebatan atau keunggulan produk, misalnya warna bagus, kuat, bermanfaat, tahan lama, dll

Kekurangan: Yaitu hal-hal yang kurang atau tidak dimiliki oleh produk, misalnya tidak bisa bergerak, tidak bertahan lama, dll.

Peluang : Yaitu kemudahan apabila produk tersebut dijual, misalnya dekat dengan pasar, belum ada yang jual produk yang sama, sedang viral dan diminati, dll.

Tantangan : Yaitu hambatan dari luar yang akan dihadapi apabila produk tersebut dijual, misalnya adanya pesaing, jarak jauh dari konsumen, modal kecil, dll.

Nama Produk : Kemiman hiasan dinding bunga kertas

Prosedur Kerja Pembuatan Produk

1. menyiapkan alat dan bahan
2. Potong kertas origami kecil" (6x6)
3. dilipat dibuat pola
4. digelinir
5. ditempel

A. Lakukanlah identifikasi kelebihan, kelemahan, peluang, dan tantangan dari produk yang anda buat.

KELEBIHAN/KEHEBATAN	KELEMAHAN/KEKURANGAN
1. menarik utk ditadikan hiasan dinding	1. tidak tahan air
2. mudah dibuat	2. tdak bisa bergerak
3. Harga terjangkau	3. tidak tahan lama
PELUANG/KESEMPATAN	**TANTANGAN/HAMBATAN**
1. diminati	1. malu menawarkan kpd org-org
2. dekat dengan pasar	2. modal masih terlalu kecil
3.	3.

B. Rencanakanlah sasaran pasar, starategi pemasaran, jenis pengeluaran, serta harga sebagaimana pada tabel di bawah ini

Aspek	Uraian
Sasaran pasar/Konsumen	penikmat seni ; karena dia akan bersedia membeli dengan harga yg cukup tinggi.
Strategi/cara pemasaran	menawarkan secara langsung; menawarkan secara langsung kpd penikmat seni dan orang"
Jenis belanja/pengeluaran pembuatan produk	kertas origami, lem stik /tembak, mudah dibuat dan modal terjangkau/ kecil
Harga produk	Rp10.000

C. Sebutkan masalah yang akan anda hadapi apabila produk yang anda buat dipromosikan untuk dijual! Kemudian uraikan solusi (cara) agar masalah tersebut dapat teratasi.

Sumber masalah	Masalah/Kesulitan/Tantangan	Solusi Masalah
Saat rencana pembuatan produk	—	—
Saat proses pembuatan produk	—	—
Rencana proses penjualan produk	Malu menawarkannya	Harus berani ul menawarkan ul mendapat dan hasil yg memuaskan

Figure 2. Students' SWOT Identification Worksheet

After performing SWOT identification, students were asked to polish the shortcoming of the product they made as the type of shortcoming they wrote in SWOT identification worksheet. It was required in order the product became more interesting than before. Final part from the learning process, students filled reflection sheet in several optional "Yes" or "No" questions. Students' self-reflection toward learning process through science wastepreneurship learning process is seen on table 7.

Table 7. Students' Self-Reflection Result

Question	Percentage	
	Yes	**No**
Processing waste by 3R principle (*reduce, reuse, recycle*) was useful for me	94.9%	5.1%
I was interested in learning much more on how to process waste	87.2%	12.8%
I wanted to re-try making compose and creativity product at home	64.1%	35.9%
I was sure that my creation will be liked by other people if it was polished again	53.8%	46.2%
Whether you wanted to business in waste processing product	30.8%	69.2%

Based on information gained from students' self-reflection result, it was known that dominant of the students (94.9%) said processing waste done was useful applied at home. Most of the students (53.8%) felt sure that product they made will be liked by others if it was polished again in the appearance, however, it was only small part of students (30.8%) who wanted to become waste entrepreneur.

Students' Self-confidence and Creativity by Science Wastepreneurship Learning Model

Before conducting learning process, students in experiment and control group were asked to fill questionnaire, likewise after being given treatment. The questionnaire was used to find out the students' self-confidence and creativity average score differences, before and after conducted the treatment. One-way ANOVA test result is shown in table 8.

Table 8. Experiment and Control Group ANOVA Test Result

Dependent Variables	Groups	Pretest			Postest		
		Mean	**F**	**p-value**	**Mean**	**F**	**p-value**
Creativity	Experiment Control	32.15 30.52	2.915	0.090	45.75 39.40	43.246	0.000
Self-confidence	Experiment Control	33.88 32.91	1.882	0.172	40.40 36.28	23.440	0.000

Based on ANOVA result, experiment and control group pretest average score were not showing any average significant differences on the entire dependent variables. On creativity variable p-value was as much as 0.90 and self-confidence variable p-value was 0.172. All of the p-value score was >0.05, it means there was no differences on pretest score average

between experiment and control group. In other words, students in experiment and control group had the same creativity and self-confidence before being given treatment.

Posttest average score in experiment and control class showed there were significant differences on all dependent variables. On creativity variable p-value was 0.000 and self-confidence p-value was 0.000. All of the p-value was showing score <0.05, it means creativity and self-confidence in experiment and control class showed that there were significant average score differences. Creativity average score of experiment class was as much as 45.75 while control class was 39.40, there was difference of 6.35. Self-confidence average score on experiment class was as much as 40.40, while control class was 36.28, there was gap as much as 4.12. In other words, learning model in experiment class made students to be more creative and confidence in processing waste if it compared to control class.

Discussion

The research aimed to test students' self-confidence and creativity before and after being given treatment of science wastepreneurship learning model. Students in control group were taught with learning model that was regularly conducted by teacher as what in administration science curriculum of class VII. Analysis of Variance finding that students' confidence and creativity taught using science wastepreneurship learning model was better than conventional learning model. This showed that science wastepreneurship learning process was effective in developing students' self-confidence and creativity.

This research finding was in line with research findings from Pudjiastuti (2020), Riastini et al. (2019), and Licy et al. (2017). Processing waste activity can encourage students in making products that can be sold. Through science wastepreneurship learning model, students were given freedom to determine by themselves what product they want to make. Based on suggestion from Ward (2010), if it wanted to develop child's creative attitude, it must not teach everything in detail, it was enough to open students' minds with introductions,

afterward gave them opportunity to think and acted on their own. It allowed students to think free and act according to their ability and interest. Tests that often presented too many in the text book were also contributed in decreasing creativity development (Sorgo, 2012). It was seen from the varied product made by students, such as: handicraft from plastic, paper, wood, leaf, patchwork, or solid and liquid compose fertilizer made from vegetable waste and rice washing water waste.

Self-confidence attitude was also showing significant result after students learned using wastepreseneurship science learning model. Self-confidence will develop well in collaborative process (Nurhayati et al., 2017). There were three cooperation ways in learning process, which were (1) *among students*, for instance through peer tutor, studying group, cooperation with students from other class or other school, (2) *between teacher and students*, for instance teacher encouraged students to discuss teacher's question, teacher asked students to investigate a problem, (3) *between student and community*, for instance with outside community or outside expert (Krajcik and Czerniah, 2014). Other factor that caused self-confidence was there was a new challenge that has not been conducted before (Cox, 2018).

Every stage of science learning activity in science wastepreneurship learning model most of them were conducted collaboratively. Starting from identification pollution problem on image and video, it was occurred active discussion activity. Creating product, as well as SWOT identification, was also conducted in group. Those activities allowed students discussion each other and did brain storming, so, it was occurred cooperation and exchange ideas. Discussion of SWOT identification was expected can help students to have active thinking to re-check product made by identifying advantage and shortcoming, and also think of the continuation of the product made by identifying opportunity and marketing challenges.

Strength and weakness identification of the products was the same as the way to think reflective, which was ability to see process of an event to get perspective or assessment

(Demir & Mayis, 2015). The ability to make assessment was important to be trained because it was part of the reflection process. Those advantages were also became the reason it was conducted students' self-reflection in the end of learning process. Students' self-reflection will also ease the teacher to gain information about students' feeling after undertaking learning process. Students felt sure (94.9%) that result from learning process through science wastepreneurship learning model was useful for their life when they were outside of the school.

Similar identification of strength and weakness with futuristic way of thinking was the ability to predict changes and also to relate current reality with reality that will happen in the future (Sommer, 2012). Exercise in thinking about opportunity and challenges will help students to think forward through analysis and predict event that will occur in the future.

Conclusion

Based on research finding and data analysis, it was concluded that science wastepreneurship learning model can develop students' self-confidence and creativity in processing waste. This model gave more opportunity for students to interact and work together in group, so it was occurred discussion process and exchange ideas. Every group was given freedom to create the type of product they wanted. The product made was assessed by themselves through Strengths, Weaknesses, Opportunities, Threats (SWOT), it stimulated confidence.

Suggestions

Science teacher was needed to pay attention and more often using science wastepreneurship learning model to train the confidence and creativity of Junior High School students in processing waste. The learning process is mostly done in groups, so the teacher needs to pay attention to the involvement of each group member in the process of discussion and project.

Limitations

This study has potential limitations. Self-confidence and creativity improvement in this research are only measured based on average score increase before and after treatment. The formation of creative and self-confidence attitude needs more permanent training and repetition more often, so that, it is needed longer observations and studies. This can be consideration for other research.

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