European Journal of Education and Pedagogy
www.ej-edu.org

The Role Macrosystems as Main Proponent of the Ecology Approach in Scientific Writing Learning

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ABSTRACT

The ecological approach is very appropriate for understanding mental, psychosocial, and linguistic development. The aim of this study is to describe the perceptions of sociocultural ecology in agro-industrial societies and their impact on scientific writing competence. Data were obtained by observation and questionnaires on 90 students at the University of Jember as student representatives with an agro-industry environment and their involvement in research and learning texts about agro-industry in the field of writing. The results show that there are groups with high sociocultural ecological perception and knowledge values and groups with low perception and knowledge values. To see the urgency of perception and knowledge of scientific writing competence, these students took a writing test and then the results were examined in terms of reasoning, text organization skills, and procedural knowledge. After the statistical tests were carried out, it was concluded that the perception and knowledge of the agro-industry macrosystem had a significant effect on students' reasoning abilities, significance (sig) 0.032 <0.05; does not have a significant effect on text organization competence with a significance value (sig) 0.067 > 0.05; and has a significant effect on procedural knowledge with a significance value (sig) 0.032 <0.05. These results indicate that the scientific productive competence of language with an ecological approach from the macrosystem aspect needs to pay attention to creativity. Greater efforts are needed to improve the development of writing on the components of unity, continuity, completeness, sequence, and point of view consistency.

Keywords: Ecology Approach, Macrosystem, Scientific Writing.

Published Online: May 22, 2023

ISSN: 2736-4534

DOI :10.24018/ejedu.2023.4.3.663

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I. INTRODUCTION

The environment is one of the important factors in supporting the educational process. Agroindustry is a constituent of subsumers in student cognition. Thus, education in the area of agro-industry is appropriate to use it as a learning context. Ecology as an approach has accommodated the development of knowledge based on the role of the environment.

Education requires an agro-industry context. On the one hand, language competence needs to be mastered with the aim of completing specific professional tasks including in complex roles in the agro-industry sector (Kolesnichenko *et al.*, 2023). The macrosystem impacts education directly and indirectly. Macrosystem aspects include social and cultural factors; policies and practices; teacher educators and teacher education as well as the influence of the mass media provide an opportunity for the world of education to move towards a better transformation (Gonzales & Gonzales, 2020). The important part of the macrosystem is not how big the impact is, but how much change in a positive direction needs to be made. This fact occurs in language content. Vygotsky's discussion shows that the sociocultural framework supports efforts to respect human diversity and emphasizes the influence of sociocultural aspects that must be integrated into teaching and learning (Newman, 2018). The success of inquiry learning is largely determined by the involvement of culture, context, and social systems.

The ecological approach not only makes educators and researchers understand student experiences, but also directs and gains in-depth inside the creation of learning environment models that can develop students' knowledge and skills (Zhang, 2018). Ecology as an approach to language learning places various layers that determine the ability to use language. The macrosystem is the most important part of the ecological approach. In it, there is an understanding of values and culture that are tied to the context of language use and have an impact on language skills.

Wuryaningrum's research (2022) shows that the macrosystem is a period that includes all elements including the social, cultural and environmental landscape. Application to the industrial agricultural context can be carried out by utilizing the industrial agricultural discourse context as part of the macrosystem landscape in the development period. The concept of a macrosystem with an industrial agricultural landscape is the role of all things related to industrial agriculture to develop sensitivity to the environment. In education, the macrosystem is not only a period, but also part of the pedagogical aspects that can be integrated with the environmental context.

In concept, according to Bronfenbrenner, to understand child development as a whole it is necessary to pay attention to four interrelated concepts: Process, Person, Context, Time or PPCT. Since Bronfenbrenner proposed micro, mesosystem, exosystem, macrosystem, and chronosystem components, awareness of the importance of involving all aspects has increased. This ecological framework emphasizes that in order to understand the phenomenon of child participation, we need to consider the conditions and processes that affect children and youth, extending the environment to consider including children's families, communities, professionals working with them, policy makers, all elements need to be considered as contributors to knowledge (Gal, 2017).

In the Bronfenbrenner concept all aspects are closely related. The macrosystem is broad, comprehensive, and relevant for viewing language development and its relationship with the environment. The macrosystem discusses developments and experiences in education that focus on cultural elements affecting a child's development, such as socioeconomic status, wealth, poverty, and ethnicity (Tudge & Rosa, 2019).

This study focuses on the involvement of aspects of the use of macrosystems in the ecological approach to learning to write. The ecology in this study refers to the industrial agricultural environment in Jember Regency, East Java, Indonesia. The component of Jember University's vision is to develop industrial agriculture. In this vision, all things can take advantage of the urgency of industrial agriculture as study material, including education. The ecological approach is applied to construct knowledge, develop creativity, and increase understanding of socio-cultural contexts. The use of the industrial agricultural context in learning is not only applied to tertiary institutions, but also to senior high schools, junior high schools, and elementary schools.

The context of the industrial agricultural environment is an appropriate aspect and creates a sense of security for students which can change students' perceptions of a material from things that are not contextual to be more contextual; from far away to nearer. This will make students feel safe (Soares, 2019). Pedagogical, psychological and linguistic are issues of language and environmental development. Isaeva *et al.* (2021) reports that language in the world of agroindustry is complex. It can be used to stimulate language skills and convey critical thinking in appropriate language. Perception needs to be known because of the complexity of the learning environment and the variety of perspectives. In agroindustry texts there are processes and results that can be accepted as thought processes and sources of knowledge. The pre-harvest and post-harvest processes to food production produce perceptions in the minds of students. It provides space for them with vocabulary stimulation, ways of conveying ideas, speaking strategies, showing logical thinking lines, and other things they need. Perception can also direct their minds to complexity, process is unimportant, and indifference because it has become so simple and mundane. Perception in learning language is very important. As a mental domain, it can determine whether learning becomes meaningful or not (Overgaard & Mogensen, 2017). This research will look at the impact of this perception and make an abstraction of how macrosystems impact scientific writing skills.

II. Literature Review

A. Ecology Approach in Language Learning

The ecological approach can be seen from the vision of classroom management. Doyle (2013) shows that the ecological approach gives consideration to classroom management by involving all environmental, social and cultural aspects to be realized and becomes an important part of the developmental stage. In the ecological approach, the most important thing is an understanding of the habitat. What is meant there is the conceptualization of the situation or context for activities in the classroom system. From this thought, it can be said that classroom management with an ecological approach refers to the involvement of the environment as a whole as a strong element at building stages of development and being able to become a tool for constructing knowledge.

In the ecological approach discussed, originally, Bronfenbrenner, showed that there is microsystem, mesosystem, exosystem, and macrosystem aspects. The microsystem is the environment that is closest to the learner's personality, which includes family, teachers, friends, etc.; Mesosystem includes interactions between microsystems where problems that occur in one microsystem will affect the conditions of other microsystems. Ecosystem is a larger social system in which children are not directly involved in interactions but can influence the development of children's character. The macrosystem subsystem consists of state ideology, government, traditions, religion, law, customs, culture, and society's values in general, and so on, where the individual is located. The principles contained in the macrosystem layer will affect the overall interactions at all layers (Ettekal & Mahoney, 2017). Subsequent developments show the chronosystem phase which includes environmental influences from time to time and how they affect development and behavior. For example, technological developments with their derivative products, such as the internet and gadgets, make students proficient, comfortable, and accustomed to using them for education and entertainment. Bronfenbrenner identified the chronosystem as an addendum to his original theory, to acknowledge that environments can change over time (Lau, 2014).

In the ecological approach, the individual is the center. Its relationship with the environment can be characterized by reference to equilibrium or balance, correspondence or reciprocity. Rummler's (2020) research on mobile-learning and ecology is very interesting. It is said that the socio-cultural ecology of mobile learning as a triangular relationship between agencies, cultural practices, and structures. It can be analogized that the ecology approach positions all aspects dealing with students' lives. The theme of the industrial agricultural environment in Jember, East Java, Indonesia is part of the relationship between public policy, natural life, and knowledge or skills towards the environment or what one wants to achieve.

From the discussion presented by Christensen (2016), it can be seen that ecological theory builds individual relationships with the environment and it is also necessary to think about its role as a strengthening group or team. Christensen's critique points to factors related to both individuals and social ties between individuals in the context

of groups in relation to global factors that need to be discussed. Bronfenbrenner's approach to ecology is fundamentally understanding what stimulates the learning process. It needs to be believed that the environment and environmental characteristics are part of developmental aspects, an important context, and need to be linked to the role of these developmental stages in the construction of knowledge in order to maximally provide benefits to the environment. Research on optimizing learning outcomes by involving the environment as a stage of understanding knowledge and re-analyzing the extent to which the individual's role in providing benefits needs to be discussed.

B. Ecology Approach in Language Learning

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C. Macrosystem as Aspect of Ecology

Ecology is a way to understand the complexity of the understanding process in the classroom. Ecological model, which provides a mechanism for understanding the interconnected and complex interactions that occur across multiple systems (e.g., policy makers, curriculum developers, teachers, and students) (Farrell, 2021). The largest part is the macrosystem.

Writing is the most complex skill in language. Listening, speaking, and reading skills are covered in it. Someone who has good reading skills is almost certain to have good vocabulary and reasoning in writing. However, it should also be noted that writing evaluates productive language skills and thinking skills. Writing, a communicative skill, can be seen as a mechanism to experience students' knowledge (Yundayani, 2021).

The range of writing is very broad, involving socio-cultural aspects as macro elements. Involvement in it makes students feel safe because they are faced with close aspects. Saghafi *et al.* (2017) reported that along the lines of the nested ecosystem model, emerging learners' writing anxiety patterns were analyzed in four categories of micro, meso-, exo-, and macro-systems. The findings from this study offer sufficient decisive evidence in support of trajectories and fluctuating variables regarding students' writing anxiety in the interaction of individual and environmental factors. Research on the role of micro, meso-, exo-, and macro in learning to write, needs to be carried out on its impact on writing skills directly, especially aspects that can be observed in the long term and are permanent, namely macro aspects.

Macrosystem refers to the larger cultural background. For students, the expression of views, values and life philosophies in their writing cannot be separated from the cultural environment in which they live, the surrounding cultural environment, the cultural environment they learn through books, and so on (Zhang, 2019). In a macrosystem perspective, writing has the meaning of integrating

environmental components in writing. One of the environmental themes is agro-industry which has the potential to become an innovation in education (Anggraini, 2017). In agroindustry, basically, all texts and types of knowledge have the potential to be developed. The Jember Regency area has enormous agricultural and plantation potential. Plantation commodities such as sugarcane, coffee, tea, cocoa and rubber are produced by state-owned, privately owned and community-owned plantations (Prihatiningrum, 2022). The agricultural and rural sectors are the livelihoods of the majority of the people in Jember. This context needs to be used to strengthen learning, including writing.

D. Macrosystem in Scientific Writing Learning

The main thing in writing scientific papers is the ability to choose content correctly (Cáceres *et al.*, 2011). In this case, choosing content requires sociocultural experience. In this case the macrosystem is very influential. Content selection is related to understanding context. The macrosystem provides a place for writers to have a lot of vocabulary and ideas for producing written language. Good writing is a matter of effective imitation (Gastel & Day, 2022), this opinion shows that writing is not only the relationship between the writer and the paper material, but also the relationship with the natural, social and cultural context. The macrosystem provides a place to understand this.

Writing learning in Indonesia is a part that is quite at risk of causing problems for students. Sari *et al.* (2021) state that basically critical thinking is appropriate for the stages of adolescent development, including university students. However, these critical thinking skills must be developed in line with a good understanding of the context. For understanding a set of social knowledge, as quoted by Brannagan *et al.* (2013) cites Bandura's opinion: critical thinking is the result of reciprocal interactions between a person's environment, personal characteristics, and behavior. Student perceptions, namely the environment, and behavior interact to facilitate learning.

The environment is an object that will become part of learning and uniquely it forms perceptions and knowledge which is the focus of the macrosystem. For this reason, the important thing in learning is the awareness that macrosystems need to be realized and facilitate learning for the benefit of linguistic, psychological, and pedagogical skills. The context of industrial agriculture as a macrosystem must be realized as a source of knowledge and forms creativity and innovation. For this reason, knowledge and perception are important to be studied further. The macrosystem contains values, laws, customs, and resources of a particular culture. For students, cultural values need to be reflected by resources and opportunities to understand the broader context (Perron, 2017). The macrosystem consists of basic environmental, social, cultural, economic and legal aspects.

In any themed context, social and cultural components are always involved in shaping knowledge and values.

Important components in scientific papers related to aspects of context are reasoning, text organization, and procedural knowledge. Reasoning is a complex problem, but complexity alone is not enough (Dowd *et al.*, 2015). Connecting context is an indicator of students' understanding of the reasoning they write. Therefore, reasoning is an important component to see the achievement of understanding the context. In scientific paper, the development of writing to form a writing structure is an etiquette in writing that needs to be considered in Cuschieri and Savona-Ventura's scientific writing (2019). Procedural knowledge is an important part of understanding the context, especially for environmental themes (Wuryaningrum *et al.*, 2020). Therefore, this research observes student achievement in these three aspects to show the urgency of the macrosystem in learning scientific writing.

E. Macrosystem as Main Proponent of Ecology Approach

The macrosystem is an important aspect of the ecological approach. The ecological approach is basically related to the mental development of children. In this research the ecological approach is used as a learning approach which is adapted to emphasize the learning context. This study views macrosystems as the main proponent because they are very suitable for scientific writing learning in which activities need to involve assimilation of the social and cultural environment context. Macrosystem as a context encapsulating any group. It is complete, and thorough in looking at the context components that can be used (Tudge *et al.*, 2009). The meaning of the main proponent is very flexible when faced with objects. Because writing scientific papers requires broad context interpretation and adequate reasoning skills because basically what teachers need to do is build perceptions about scientific writing (Pelger & Nilsson, 2016).

It is appropriate if the teacher or lecturer feels that the macrosystem is very good as part of an applicable approach. More than that, they should also understand how it has an impact and in what ways it has an impact so that we can strengthen it or vice versa. In the ecological approach, other aspects such as microsystems and mesosystems cannot be differentiated. However, it is good if we have views from reviewing the content of one of the components and adapting it to the needs. Writing scientific articles is related to critical thinking (Ebadi & Rahimi, 2018). Therefore, the macrosystem components are very appropriate as a basis for adaptation in learning to write scientific articles.

III. Research Methods

A. Participants

This research was applied to 90 students who were selected based on their involvement in the agro-industrial theme as part of the vision of sociocultural ecology education at the University of Jember. These students are students who take courses in writing scientific papers in the Indonesian language and literature education study program. Besides that, they are currently taking a discourse analysis class. During this research period, the lecturer integrated sociocultural ecology with an emphasis on macrosystem aspects. The goal is to improve critical thinking skills, understand the technical aspects of writing scientific articles, and understand how to convey procedures in writing. The application involves various examples of texts containing macrosystem aspects consisting of texts on industrial coffee and cocoa agriculture, agricultural policies, attitudes in evaluating regions according to the role of the environmental context and procedural scientific knowledge of processing

and production of agro-industrial plants. Students who take scientific article writing courses have the ability to write scientifically, but do not yet have lucid knowledge about presenting context in writing and developing paragraphs. These students come from various regions in Indonesia, their positions are in semester 6 or level 3 in tertiary institutions, they enter tertiary institutions and study programs in 2020. They consist of 18 males and 72 females.

B. Instruments

Instruments were arranged to obtain information about (1) student categorization regarding the understanding and perception of macrosystem aspects, (2) the ability to write scientific articles.

For this reason, it is necessary to have a questionnaire 1 containing questions about their perceptions of (1) the agro-industry area as a characteristic of the city, (2) the processing of cocoa and coffee, (3) the components that make coffee or cocoa can be categorized as useful foods, (4) agro-industry as culture or customs, (5) policies or legal foundations in industrial agriculture. Instrument II is a scientific article writing skill test with the main focus of the assessment rubric on content reasoning, paragraph development techniques, and procedure descriptions.
Questionnaire (Instrument 1) can be observed in this table.

TABLE I: MACROSYSTEM PERCEPTION QUESTIONNAIRE

Perception Question	Alternative Answer	Other Answer
Jember is an agro-industry area and therefore its characteristics need to be maintained	a. It is enough to continue as it is being done now b. It needs to be maintained with innovative technology c. It needs to be improved by involving various sectors	
The process of processing coffee or cocoa needs attention	a. Traditional processing is sufficient b. Processing according to effectiveness needs to be educated c. Modern processing at its best	
Coffee and Cocoa nutrition	a. Food or beverage with a strong impact ingredient that need limited consumption b. Good nutrition is obtained by consuming it properly c. Natural food or beverage and can be consumed freely consumed	
Agro-industrial Community Culture	a. Have a special cultural policy that needs to be developed b. Agricultural society working with plantations c. Farmers who have a culture according to their tribe	
Industrial agricultural law and policy	a. Developed and disseminated to provide benefits to people's agriculture b. View the law in general based on a consistent basic law c. Observe efforts to save the environment in accordance with the constitution	

Students are asked to write scientific papers and assess the results of their writing through the aspects of reasoning, text organization, and procedural knowledge. The themes of the writing are issues of education and education policy, cultural preservation, and environmental health. Besides that, they can also have other themes that they think are important and interesting.

In order to observe macrosystems in an ecological approach, it is necessary to describe learning activities in scientific paper writing classes with the integration of an ecological approach focusing on macrosystems. The learning stage is described as follows.

TABLE II: MACROSYSTEM PERCEPTION LEVEL

Macrosystem Perception	Perception Level			
	Very good (4)	good (3)	average (2)	poor (1)
Jember as an agro-industrial area Proper processing of coffee/cocoa Nutrition coffee / chocolate Agro-industry community culture policy and legal basis in the area of agro-industry				

The five aspects in the questionnaire (instrument 1) were then assessed and categorized based on their answers. The answer results can be categorized as high ($20 \geq X \geq 14$); low ($14 > X \geq 5$). From these categories, the class was divided into two: A groups (high scor perception) and B group (low scor perception). Both classes took a scientific writing test and were assessed based on 3 criteria: reasoning, text organization, and procedural knowledge.

C. Research Procedures

The workflow of this research was carried out with the following procedure stages.

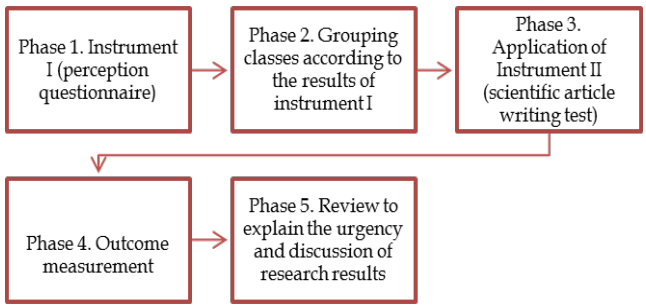

Fig. 1. Research Workflow.

Phase 1: students receive a questionnaire in which the five aspects in the questionnaire are then assessed and categorized based on their answers. The answer results can be categorized as high ($20 \geq X \geq 14$); low ($14 > X \geq 5$).

Phase 2: the class is divided into two groups A and group B.

Phase 3: Both classes took a scientific writing test and were assessed based on 3 criteria: reasoning, writing development, and procedural knowledge.

Phase 4: Measurement of the impact of perception on reasoning, writing development, and procedural knowledge.

Phase 5: the meaning of macrosystems in learning, researchers observe students' answers and conduct theoretical studies to provide an overview of the achievements obtained by students.

D. Data Analysis

This study uses two models of analysis:

(1) quantitative analysis with non-parametric inferential statistical tests. The analysis application used is SPSS version 26. This analysis is applied to find out the impact of macrosystem perception on scientific paper writing skills.

(2) qualitative analysis to review test results based on macrosystem theory or concepts. The purpose of this analysis is to provide conclusions on recommendations for macrosystem involvement and what additional actions need to be taken. Based on the measurement results and student work trends, it can be seen the content and characteristics of the application of the macrosystem. Thus it can be used by the teacher to make recommendations and modifications in learning.

To see the significance of macrosystems in learning, researchers observed students' answers and conducted theoretical studies to provide an overview of student achievements. This was done to analyze (1) the meaning of the macrosystem on reasoning, (2) the meaning of the macrosystem on the development of writing, (3) the meaning of the macrosystem on procedural knowledge.

IV. Results and Discussions

A. Effect of Agroindustry Learning Macrosystem Perception on Reasoning

ability In order to observe macrosystems in an ecological approach, it is necessary to describe learning activities in scientific paper writing classes with the integration of an ecological approach focusing on macrosystems. The learning stage is described below.

TABLE III: Learning Activity

Learning Phase	Activity
Opening	The lecturer conveys the context of the sociocultural environment for students to understand as part of the material for critical thinking skills. In this phase, the lecturer provides text, photos and videos about social phenomena.
Knowledge Sharing	The lecturer explains the discourse structure and effective ways to write. In this activity, the lecturer provides directions on writing rules and efforts to avoid ambiguity for readers, including citation ethics and avoiding plagiarism.
Connection Compilations	Students convey views on sociocultural phenomena presented by lecturers at the beginning of learning. Lecturers provide support, clarification, and the latest references to enrich students' critical responses.
Defend opinion	Students submit maps, infographics, or power points about macrosystems and sociocultural phenomena and they receive criticism and suggestions from their friends. In this phase they defend their opinions with the lecturer's reasoning and directions as in the fourth phase.
Project Productions	Students submit maps, infographics, or power points about macrosystems and sociocultural phenomena and they receive criticism and suggestions from their friends. In this phase, they defend their opinions with the lecturer's reasoning and directions as in the fourth phase. Students find topics to write about in scientific papers, develop writing, and write according to the structure as project activities.

The description of the learning phase shows the application of the macrosystem which is indicated by the macrosystem aspect in the form of a text on agricultural policies, procedures for processing agricultural products, the perspective of the agro-industrial community, and so on. Impact testing is carried out in the production phase. Previously, students had been categorized based on the results of the questionnaire.

Based on the results of data collection through a questionnaire, obtained data on student agro-industry learning macrosystem perceptions. Furthermore, the results of the perception of the agro-industry learning macrosystem were grouped into two groups, namely the high group and the low group. The next step, the two groups were given a test which included; reasoning, writing development skills, and procedural knowledge.

The analysis was carried out by identifying normality test data, non-parametric inferential statistical tests. The following is an explanation of normality test of A Class and B Class reasoning ability.

TABLE IV: Data Normality Test Perception on Reasoning Ability

One-Sample Kolmogorov-Smirnov Test		Reasoning _A	Reasoning B
N		45	45
Normal Parameters[a,b]	Mean	8.1333	7.7556
	Std. Deviation	0.89443	0.77329
Most Extreme Differences	Absolute	0.248	0.246
	Positive	0.248	0.243
	Negative	-0.219	-0.246
Test Statistic		0.248	0.246
Asymp. Sig. (2-tailed)		0.000[c]	0.000[c]

Based on Table IV above, it is obtained that class A reasoning data has a significance (Sig) of 0.000 <0.05. So, the class A reasoning data is not normally distributed. Likewise, class B has a significance (sig) of 0.000 <0.05, thus class B reasoning data is not normally distributed. The next step is to examine the effect of macrosystem perception on reasoning by using the non-parametric inferential statistical test using the Mann Whitney U test technique.

The results of the different test with the Mann Whitney U test technique can be presented in the following table.

TABEL V: Statistics Test with the Mann Whitney U Test Technique on Reasoning Ability

Test Statistics[a]	
	Reasoning
Mann-Whitney U	765.500
Wilcoxon W	1800.500
Z	-2.144
Asymp. Sig. (2-tailed)	0.032
a. Grouping Variable: class.	

Based on Table V of the difference test using the Mann Whitney technique above, a significance (sig) of 0.032 <0.05 is obtained, thus the null hypothesis is rejected. It can be interpreted that the perception of the macrosystem of agroindustry learning has a significant effect on students' reasoning abilities.

B. Effect of Macrosystem on Text Organization Skills

The testing stage of the influence of the perception of the agro-industry macrosystem on writing development skills: data normality test for class A and class B writing development skills and statistical test according to the results of normality of the data to see the significance of

macrosystem perception to the skill of developing writing. The normality test results are described in the table below.

TABEL VI: NORMALITY TEST OF TEXT ORGANIZATION SKILLS

One-Sample Kolmogorov-Smirnov Test			
		Text Organization _A	Text Organization _B
N		45	45
Normal Parameters[a,b]	Mean	15.7778	15.3111
	Std. Deviation	1.25931	0.94922
Most Extreme Differences	Absolute	0.176	0.206
	Positive	0.176	0.206
	Negative	-0.145	-0.188
Test Statistic		0.176	0.206
Asymp. Sig. (2-tailed)		0.001[c]	0.000[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Based on Table VI above, it is obtained that class A text development test data has a significance (Sig) of 0.001 <0.05, so the data on the results of class A writing skills development are not normally distributed. Likewise, class B has a significance (sig) of 0.000 <0.05, thus the data on writing skills for class B is not normally distributed. The next step to test the effect of macrosystem perception on text organization skills can be used non-parametric inferential statistical tests using the Mann Whitney U test technique.

The next step is to find out the effect of macrosystem perception on writing development skills by using the non-parametric inferential statistical test using the Mann Whitney U test technique. The results of the different test with the Mann Whitney U test technique can be presented in the following table.

TABLE VII: STATISTICS TEST WITH THE MANN WHITNEY U TEST TECHNIQUE ON TEXT DEVELOPMENT SKILLS

Test Statistics[a]	
	Text Organization Skills
Mann-Whitney U	793.000
Wilcoxon W	1828.000
Z	-1.832
Asymp. Sig. (2-tailed)	0.067
a. Grouping Variable: Class.	

Based on Table VII, the difference test with the Mann Whitney technique above, a significance (sig) of 0.067 > 0.05 is obtained, thus the null hypothesis is accepted. It can be interpreted that the perception of the agro-industry learning macrosystem has no significant effect on the students' development skills.

C. Effect of Macrosystem Perception on Procedural Knowledge

Based on Table VIII, it is obtained that class A procedural knowledge data has a significance (Sig) of 0.000 <0.05, so the data resulting from class A procedural knowledge are not normally distributed. Likewise, class B has a significance (sig) 0.000 <0.05, thus class B procedural knowledge data is not normally distributed. The next step is to examine the effect of macrosystem perception on procedural knowledge by using the non-parametric inferential statistical test using the Mann Whitney U test technique.

The results of the significance test of macrosystem perception on procedural knowledge statistically with Mann Whitney can be observed in Table IX.

TABLE VIII: NORMALITY TEST OF PROCEDURAL KNOWLEDGE

One-Sample Kolmogorov-Smirnov Test			
		PK_A	PK_B
N		45	45
Normal Parameters[a,b]	Mean	8.8000	8.4222
	Std. Deviation	0.72614	0.49949
Most Extreme Differences	Absolute	0.258	0.379
	Positive	0.258	0.379
	Negative	-0.253	-0.299
Test Statistic		0.258	0.379
Asymp. Sig. (2-tailed)		0.000[c]	0.000[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

TABLE IX: STATISTICS TEST WITH THE MANN WHITNEY U TEST TECHNIQUE ON PROCEDURAL KNOWLEDGE

Test Statistics[a]	
	Procedural Knowledge
Mann-Whitney U	730.500
Wilcoxon W	1765.500
Z	-2.550
Asymp. Sig. (2-tailed)	0.011

a. Grouping Variable: Kelas.

Based on Table IX, the difference test using the Mann Whitney technique above, a significance (sig) of 0.032 <0.05 was obtained, thus the null hypothesis was rejected. It can be interpreted that the perception of the macrosystem of agroindustry learning has a significant effect on students' procedural knowledge.

D. Discussion about the Role of Macrosystem

From the quantitative results obtained, there are several points that need to be explained from a qualitative aspect. Macrosystem learning as part of ecology, at the University of Jember is carried out using the Outcome Based Education (OBE) model with a model that activates students to construct knowledge independently, solve problems, and work on project assignments by involving them in studies related to industrial agriculture. It can be interpreted that the perception of the macrosystem of agroindustry learning has a significant effect on students' reasoning abilities.

In writing scientific articles or scientific papers, reasoning is needed to show coherence between objects and arguments, causal relationships between concepts and facts, and the accuracy of illustrations, and analogies as well. In forming reasoning, students need an understanding of how the environmental context provides understanding. In the macrosystem, this is discussed in the study of the context of discourse. The following table analyzes the macrosystem aspects of the ability to form reasoning.

From the table it can be seen that macrosystems with an introduction to the context of science and socio-cultural contexts can direct students to develop thinking skills in compiling scientific papers. However, the scientific context needs to be based on how to convey it in an appropriate language. Students with positive perceptions or high scores relatively have the ability to reason well through their perceptions of data and data analysis. These results corroborate the research of De La Paz (2005) who reports that social studies on cultural and indigenous diversity improve writing skills. Other research also shows that scientific reasoning is the most important part of the explanation. Besides that, claims and evidence are two other things that are very important to express by understanding the text.

TABLE X: ASPECTS OF REASONING IN MACROSYSTEMS

Macrosystem Aspect	Reasoning Aspect	Representation on Wrting
characteristics of agro-industrial areas	industrial agriculture categorization	generalization, description, narrative
processing of cocoa and coffee or cocoa	logic in sequencing processes	procedure-logical explanation
components that can be coffee or chocolate categorized as beneficial foods	causal reasoning, compiling scientific evidence	rational explanation of causality
agro-industry as culture or custom	impact of rational habits, the accuracy of historical sequences, and rationalizations about people's behavior	analogies and illustrations
policy or legal foundations in industrial agriculture	the emergence of policies to benefit people's agriculture	exposition and argumentation

Thus, it can be said that the meaningful thing from microsystems in the ecological approach is to provide support for forming analysis to categorize, help understand explanations of logical sequences, provide sharpness in determining causal relationships, support how to structure evidence, and strengthen the presentation of arguments with scientific evidence.

It is interesting to see the opinion that all elements need to be considered as contributors to knowledge (Gal, 2017). The context of knowledge is everything that is in the context of life. The macrosystem develops with the development of eras and civilizations. The macrosystem is not static. One way to keep learning on track with the context of time is to involve the teacher in the macrosystems faced by students. This research reveals the macrosystem of industrial agriculture as the best ecological object in Indonesia. From the macrosystem of industrial agriculture, college students can gain reasoning on aspects of causal relationships, analyze people's perspectives, habits, and values that are believed to be true. For example, the view that coffee is a drink that must be added with sugar, cannot be drunk without sugar by the industrial agricultural community, can be understood as a habit of life related to the perception of taste. Therefore, they can be more adaptive in seeing the characteristics of community groups. This is a valuable lesson in showing that the virtue of macrosystems is not in their content, but in how the components within direct us to reason and use critical thinking skills.

In developing writing skills, there are several things that need to be considered, one of which is the accuracy in compiling the structure and developing it by paying attention to the organization of paragraphs consisting of unity, continuity, completeness, sequence and consistency of point of view. The text organization or writing development component is closely related to language and writing skills. The application of macrosystems leads to thought processes and content. Aspects of language skills can only be trained by making students aware of writing with good paragraph organization by paying attention to all aspects

Quantitative data shows that the macrosystem has no significant impact or there is no significant effect between writing skills and microsystem perception. Thus, another effort is needed to improve the problem of writing development, especially paragraph organization. Ideally, paragraphs consist of a topic sentence, supporting sentences, and a concluding sentence. Melati (2020) reports that the difficulty in organizing writing is compiling conclusions. In this study, paragraph organization. Language aspects, especially those related to grammar and mechanical aspects, are the focus of the lecturer's attention. This makes students experience difficulties in organizing text (Siddiqui, 2020). From the results of this study, it can be seen that in teaching writing, text organization analysis techniques with innovative learning models are needed to be combined with macrosystem aspects.

Organizing text is a mechanical aspect that is quite prone to being problematic. Students who live in a diglossia situation have difficulty following scientific writing patterns. In general, the problems of scientific writing are the same as those of writing other articles, students in college have problems with effective sentences when they write down ideas. Text organization is not only a matter of reasoning, but also a matter of context and context management, the ability to construct cohesion and coherence in paragraphs. This ability cannot be obtained by understanding the context, but needs practice, reading examples of how to develop paragraphs. Socicultural ecology provides space for students to understand the contents of scientific writing materials, develop ideas from various perspectives. It does not provide a significant way of solving the problem of text organizing skills. What we can learn from learning the structure of the text is a matter of behavior that cannot be changed with knowledge without sufficient training. The theory of behavior change in learning is appropriate, in this case. College students need to understand that writing structure is a matter of how to arrange layers of ideas, not a matter of the content of each layer. Therefore, reflection for macrosystems is to provide opportunities for college students to observe various best practices in the structure of scientific writing. Thus, they will have both substance and good paragraph and sentence construction.

Quantitative analysis shows that there is a significant effect of macrosystem perception on procedural knowledge. If observed, there are at least several parts of learning with an ecological approach that show procedures and provide variations in explanations of procedures. In fact, there are comparative evaluation procedures. Coffee processing with traditional procedures and coffee processing with modern procedures. Both can be analyzed by looking at the logical stages, workmanship techniques. After this procedure, students can analyze the advantages of each system.

In the next stage, students can relate to the social and cultural context of coffee consumption in agro-industrial communities. In the agro-industry community, the definition of coffee as a drink or known as "wedang kopi" is a different concept from coffee or coffee as a beverage. “wedang kopi” is synonymous with the taste of coffee because of that the sweet taste of sugar is balanced with the bitter taste. In the development of coffee in the agro-industry community, coffee is enjoyed as coffee with an original taste and the sweet taste of sugar is added in small amounts so it doesn't change the original taste of coffee.

From the explanation above, it can be seen that in the procedure students learn several things, namely, the stages of doing work, comparison of stages, the relationship between work procedures and social culture and ethics, as well as social variations in implementing procedures. We can make an analogy of what Davis found (2019). In his findings he

reported that gestures increase procedural knowledge in language. Thus, it can be analogized that the visualization of teaching materials, direct observation, pictures of the cycle stages provide an increase in aspects of procedural knowledge. It is an important part that is given through macrosystems in ecology. Observation of the environment, socio-cultural context cannot avoid media and visual teaching materials. Thus, the significance of macrosystems for procedural knowledge is to provide opportunities for students to fully understand procedures and provide visual space in the learning process.

It is common that procedural knowledge is found in the environment. In the context of industrial agriculture, macrosystems provide various information on how to plant, harvest, and produce consumables. All of these are processes that require an understanding of a logical sequence. How to do something is procedural knowledge. College students can understand the process of processing coffee from the cherry process, milling, roasting, and grinding. This is a representation of declarative knowledge or the realization of declarative knowledge. Procedural knowledge demonstrates the ability to fully understand the environmental context. Macrosystem involvement in learning has a significant impact on procedural knowledge. In writing scientific papers, teachers need to involve macrosystems to make students understand the context or use the richness of the context to understand procedures and make students have the skills to use variations of scientific sentences. Marzano *et al.* (1997) proposed that there is an opinion that procedural knowledge is considered more important than declarative knowledge. This opinion is of course wrong and unfounded because actions or practices that make students 'able to do' must be based on a proper understanding of the material they are doing. Marzano *et al.* (1997) state that acquiring a skill without understanding the various concepts related to the skill could result in students' acquiring knowledge that is limited to use. The macrosystem not only understands the declarative component of knowledge, but also provides an effort to achieve the meaning of learning. If the student sees the concept of agricultural policy, he or she will see it as a rule. In their view of the policy, they do not yet understand how it works in people's lives. Through the macrosystem with an understanding of the environmental context, students will understand what the purpose of agricultural policy is, how it is beneficial or detrimental, and how the psychology of society accepts the policy.

V. CONCLUSION

From the results and discussion of this study, it can be concluded that positive macrosystem perceptions have a significant effect on procedural knowledge and reasoning and have no significant effect on text organizational skills. From this explanation it can be seen that there is significance that needs to be maintained and even improved in the application of macrosystems as part of ecology in learning, namely (1) reasoning with multidisciplinary studies can be recommended to strengthen reasoning abilities in writing scientific papers. Presentation of arguments with scientific evidence requires variation in teacher action as innovation in learning; (2) procedural knowledge needs to maintain consistency in involving social and cultural values as information enrichment in procedures to teach students procedures comprehensively; (3) text organization skills need to be strengthened by innovative delivery of material. However, macrosystems are concerned with the content and direction of thought procedures, not directly related to how text is organized. In particular, the perception of the macrosystem can support skills in expressing ideas with contextual content covering aspects of the social and cultural environment context. Positive perception of the macrosystem strengthens thinking skills, particularly reasoning and procedural knowledge. Therefore, there is a need for a special solution to improve students' ability to organize text. In future research, understanding text structure needs to be considered as part of the focus of improving learning. This study shows that positive perceptions of macrosystems as shown by student activities in following developments, involving themselves, and showing a caring attitude towards macrosystems as part of ecology can improve scientific writing skills in the aspect of reasoning (critical and analytical) and improve procedural knowledge because they already have prior knowledge to understand how things work and procedures.

ACKNOWLEDGMENT

I give my best appreciation to research group program or *Ke-Ris* (*Kelompok Riset*), Research institutions and community services or LPPM, Universitas Jember for the opportunity to doing the research in accordance with the vision of the University of Jember. I'm proud to be able to write the research according to the vision of our study program: sociocultural ecology.

CONFLICT OF INTEREST

I would like to say that all aspects of this research do not have a conflict of interest with any person or organization.

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