UTILIZING THE GEOECO-BOOK LEARNING PACKAGE TO IMPROVE ECO-LITERACY OF Z GENERATION STUDENTS IN ELEMENTARY SCHOOLS

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ABSTRACT

The issue of environmental damage has become a contemporary issue and a limelight of the world today. To anticipate environmental disasters needed a strategy that can change the paradigm of the community so that people are more literate about the environment and have a high understanding of the importance of the environment. Environmental education exists and is designed to increase students' eco-literacy of environmental problems that occurred during the 21st century and provide efforts in saving the environment. This study aims to determine the geoeco-book learning package to improve the ecoliteracy of alpha generation of elementary school students. Research and Development was chosen by involving 50 students at Cipinang Melayu 04 East Jakarta Elementary School as a randomly selected sample. This geoeco-book learning package refers to the goal of environmental education which emphasizes the process of introducing values and environmental morals by explaining concepts relevant to basic ecological material in order to develop core competence eco-literacy. Data were analyzed using descriptive statistics and t-tests to verify product differences and effectiveness. The results showed that there was an increase in the effective and significant generation of Z generation of students after they learned the learning package. Therefore, even though they are an alpha generation, they have a serious interest in reading and understanding learning packages as products. This is one way to change eco-literacy and expect changes in their attitudes towards the environment that will ultimately be more positive in their environmental behavior.

Keywords: *Geoeco-Book; Environmental Education; Eco-Literacy, Z Generation*

INTRODUCTION

Environment and humans are a system that cannot be separated in forming a relationship that affects each other. Humans have a dependency on their environment, both physical and social environment. The way humans view their environment, makes humans as the main subject in the order of the process of

interaction with the environment. The global crisis that occurred lately, can estimate the world view of humans in interacting with their environment. During this view point puts humans at the center of the order of the universe.

This causes humans to desire to carry out activities such as exploitation to meet their daily needs, without regard to environmental sustainability

The issue of environmental damage globally has become the latest issue and the limelight of the international community. Therefore, we need a strategy that can change the paradigm of the community, so that people are more environmentally conscious (have eco-literacy) and have a high understanding of the importance of the environment. The use of appropriate learning packages will help teachers transform knowledge to students. This learning package will certainly be developed with the aim of increasing student's eco-literacy by presenting relevant material about basic ecology and containing environmental values and morals.

Environmental education should be the main priority in school education. This education is multidisciplinary in nature and can therefore be a challenge for many teachers in teaching it to students in

schools, the transformation of science must include content knowledge about climate change issues, attitudes towards the environment, and commitments to action that are presented on materials and themes that match the issue of climate change (Oversby, 2015).

The conceptual construction and deconstruction process must be carried out in environmental education theoretically to support or criticize pedagogical documents and teaching materials that have been developed previously, it is due to our lagging in educational activities. (Santiago, Cunha, & Cartea, 2017).

Various controls must be considered in defining the general determinants of environmental behavior. Environmental education is the right tool to shape the green behavior of green citizens. In a comprehensive way intrapersonal, motivational, interpersonal, and educational factors determine a person's green behavior (Varela-Candamio, Novo-Corti, & García-Álvarez, 2018).

By paying attention to the various studies above, in an effort to achieve the goals of environmental education, a research about Instructional Packages is needed that is suitable with the needs of Z Generation students and is very necessary

in learning integrative environmental education. Ecological literacy or eco-literacy as a term used to describe humans who have reached a high level of awareness about the importance of the environment. Eco-literacy comes from two words, namely eco and literacy. Eco comes from Greek which means household, and logos itself means knowledge. Literacy in English means literacy or more broadly defined as the condition of someone who already understands and knows about something (Keraf, 2017). So that it can be interpreted as a condition where people have been enlightened about the importance of the environment. Eco-literacy is a logical component of education for sustainable development (Education for Sustainable Development) because the focus is on the interaction of different elements in the environment including human activities that are very important for community achievement self-sustaining resources for future generations (Locke, Russo, & Montoya, 2013).

The new culture of sustainable society, all members of society organize their lives based on consideration of the importance of environmental protection and preservation. This comes from awareness about the importance of the environment which is called eco-literacy. This awareness that animates the entire arrangement of human life, ranging from consumption of basic needs, energy consumption, use of technology, and all household appliances, use of facilities and transportation, livelihoods, agricultural patterns, business and industrial development, economic, social, political, and so on. From the above study, what is meant by environmental literacy (eco-literacy) is the understanding of someone who has reached a high level of awareness about the importance of the environment (Keraf, 2017).

Learning designed in instructional packages for integrative environmental educaton will encourage students to be able to learn independently and contextually. Instructional packages are developed based on the phenomenon of environmental issues from time to time, especially those that occur in the 21st century, which lately many of us feel the impact on life. The learning strategy developed is Problem Based Learning (PBL), which aims to enable students to learn on their own with the various problems posed by climate change through the stages of the scientific method. So that students have a broad

understanding of the thematic learning content to anticipate environmental damage and its effects that occur.

Z generation which is also called I-generation, net-gen, and digital natives refers to young people born in the mid-1990s to the end of 2010 who are accustomed to technological advances in multimedia, like tablets, smartphones, social media, and flat-screen televisions, become accustomed to interacting and communicating in a connected world all the time (Turner, 2015). Identify all groups of generations (from the Veterans generation to the Alpha generation) is shown in **Table 1**.

Table 1. Generation Group Identification Based on Birth Years

No	Range of Birth Year	Generation Group
1	1925 – 1946	Veteran generation
2	1946 – 1960	Baby boom generation
3	1960 – 1980	X generation
4	1980 – 1995	Y generation
5	1995 – 2010	Z generation
6	2010 +	Alfa generation

Source: (Bencsik, Juhász, & Horváth-Csikós, 2016)

The six groups of generations above have different characteristics. The development of Z Generation behavior characteristics is significantly shaped and influenced by diverse environments and surrounding elements. They grew up together with a very sophisticated media and technological environment that has made them internet savvy citizens using the internet and far more skilled than their predecessor generation. So the characteristics of Z generation are influenced by an environment that is already advanced and technology oriented so that they have more skills, particularly in utilizing technology compared to previous generations (Salleh, Mahbob, & Baharudin, 2017).

Even though the technology of digital Z generation technology is good, there must still be mentoring of an educator through learning activities, this is in accordance with research conducted by Pérez-Escoda, Castro-Zubizarreta, & Fandos-Igado (2016), entitled Digital Skills in the Z Generation: Key Questions for a Curricular Introduction in Primary School states that, media convergence and the use of devices connected to the Internet occur on a large scale, which causes changes in the new digital skills needed for Z generation in facing the challenges of digital society. The results of this study indicate that digital competence is not inherent in the practice of using digital devices, but requires special learning. If not, there is a danger

of creating a digital divide, not because of the frequency of use or access to the connected device but the lack of accompanying instructions on how to use the device. The use of technology such as by Z generation is thought to have an addictive effect and significantly disturb social relations. Therefore, not only is the role of the teacher (as an educator) needed, the role of parents also has a big role, especially in overseeing the use of technology in the Z generation.

Therefore, the development of a learning package that includes learning components and tools is arranged systematically by following the education rules of the Research and Development, followed by an effectiveness test through experimental activities to find out whether the developed geoeco-book learning package can improve eco-literacy of Z Generation students.

MATERIALS AND METHODS

This research was conducted at Cipinang Melayu Elementary School 04 East Jakarta. While the instructional package effectiveness test is carried out in August to October in the odd semester of the 2019-2020 school year. This research will produce a product in the form of an instructional package of geoeco-books in integrative environmental education, which is a learning package that will be used in order to improve the eco-literacy of Z generation students.

Sampling in this study was carried out by means of multistage random sampling. Broadly speaking, the steps for developing a learning package in this study are as follows: (1) information collecting, including gathering information or data to determine the objectives to be achieved from the products produced; (2) preparation and product development (design and development product), identifying and formulating goals, determining the competencies that must be achieved by students, designing instructional package design models and developing material, evaluating and revising instructional packages made; (3) the effectiveness of the geo-book learning package is tested through an experimental method in which the results will be used as material for analysis and recommendations. The instructional package development research uses the Research and Development approach developed by Dick, Carey, & Carey (2009) is shown in **Figure 1.**
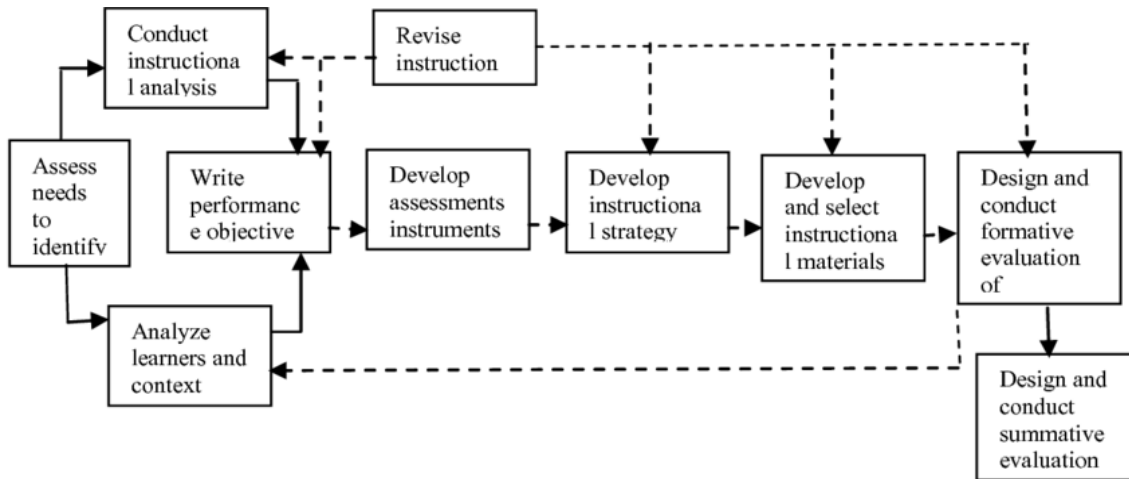
Figure 1. Dick and Carey's Instructional Design Model
Source: Dick, Carey, & Carey (2009)

Quantitative research data analysis was used to test the effectiveness of teaching materials. The effectiveness test data were the eco-literacy of elementary students who used the ecology learning package as an experimental group and elementary students who did not use the ecology learning package as a control group. The results of the calculation of the eco-literacy score are tested for differences by using a t-test at the significance level $\alpha = 0.01$. Before being analyzed the normality test was carried out using Kolmogorov-Smirnov, and the Bartlett homogeneity test using the F test at a significance level of $\alpha = 0.01$. Analysis of the different tests (t-test) was done by distinguishing the pretest scores with the post-test in the treatment and control groups. Distinguishing post-test scores between treatment and control groups. Differentiating the gain scores of the treatment group from controls. The experimental design drawings can be figured out below:

O1	X	O2
O1	C	O2

Note:

X = Treatment, using *geoeco-book*

C = Control

O1 = Observation/pre-test

O2 = Observation/post-test

RESULTS AND DISCUSSION

Geoeco-book learning packages developed are still very limited both in terms of quantity and quality. The substance of the material discussed in the teaching material is not fully presented which contains the values that are integrated with the objectives of environmental education. Based on the results of the preliminary study, the initial step in developing the learning package in

this study is to formulate goals relating to the Z generation eco-literacy. Based on these thoughts, a learning package is produced about the basic concepts of ecology, and in its development the objectives are formulated as follows:

1. Z Generation students know the basic concepts of ecology which include: basic concepts of ecosystems, food chains, energy, biogeochemical cycles, and environmental pollution.

2. Z Generation students understand the effect of human existence on the environment and the efforts that humans can make to preserve the environment.

3. Knowing environmental problems that occur and understanding efforts to solve environmental problems that occur.

4. Have a good ecological literacy, so that they can behave responsibly and wisely towards the environment.

Learning is done using 3 handout packages, namely (1) basic concepts of ecosystems, (2) food chains, and (3) basic concepts of energy, biogeochemical cycles and environmental pollution. The results of the analysis of the material that has been done are then used as the basis for developing the geoeco-book learning material. The material development begins with the formulation of core competencies, basic competencies and indicators, which are then elaborated into a number of basic competencies and indicators of student learning achievement.

The next step is to develop a learning package (Design and Development Product) so that a draft learning package is produced. The material development is supported by several relevant source books as reference material to explain important concepts related to the basic concepts of ecology. While the environmental phenomena that are commonly found around students' environments are used as a source of learning to make it easier to improve eco-literacy in understanding the concepts given. The principles of material preparation refer to the design of learning packages designed for research purposes. The design of developing geoeco-book learning packages refers to environmental education objectives that emphasize the process of recognizing values and explaining concepts in order to develop core competence eco-literacy. Thus environmental education integrated with science learning aims to improve students' eco-literacy.

The design of the development of learning packages illustrates that the environment as a source of learning is a

description of a contextual approach that explains the relationship between the knowledge it has with the facts contained in daily life. Thus the resulting learning package will provide opportunities for Z generation students to construct their knowledge based on facts and information obtained through technology and information, so that the material learned becomes more meaningful.

Testing the effectiveness of teaching materials is done by the experimental method. The effectiveness test was carried out on the fifth generation students of class V elementary school, each of which was divided into a treatment group and a control group. The treatment group was class V students at Cipinang Melayu 04 Elementary School in East Jakarta who studied using the geoeco-book learning package, and the control group was the class V group at SD Cipinang Melayu 04 East Jakarta who did not use the geoeco-book learning package. Each group is given a pre-test to find out the student's initial eco-literacy, and the next activity of the treatment

group is given time to study the geoeco-book learning package online at home for 6 weeks. At the end of the activity, the two groups were given a final test (post-test) to find out the increase in student eco-literacy.

Based on the results of the effectiveness test shows that the post-test and gain score in the group of students who learn to use the geoeco-book learning package is higher than the group of students who do not use the geoeco-book learning package. To see the difference between the two groups, a statistical analysis is performed, as described in the following discussion. Detailed effectiveness test results can be seen in **Table 2**.

Table. 2 Description of Pre-Test and Post-Test Score Data from the Control and Treatment Group on the Effectiveness Test of the Geoeco-Book Learning Package

Students' Ecoliteracy		Group	
		Treatment	Control
Pre-test Score	N	25	25
	Total	2072	2091
	Mean	82,88	83,64
	Modus	83	84

Students' Ecoliteracy		Group	
		Treatment	Control
Post-test Score	Median	83,00	84,00
	Score Interval	77 – 87	75 – 94
	Standard Deviation	2,789	4,663
	Variance	7,777	21,740
	N	25	25
	Total	2236	2198
	Mean	89,44	87,92
	Modus	94	88
	Median	89,00	88,00
	Score Interval	78 – 97	74 – 100
	Standard Deviation	5,546	5,992
	Variance	30,757	35,910
	N	25	25
	Total	164	107
	Mean	6,56	4,28
Gain Score	Modus	11	4
	Median	6,00	4,00
	Score Interval	2,757	1,329
	Standard Deviation	22,98	14,17

Source: Research Analysis, 2020

Statistical analysis was used to see differences in the results of treatment pre-test and post-test in both groups using t-test. As a prerequisite for t-test, every data obtained is tested for normality. Test normality with the Kolmogorov-Smirnov test on pre-test, post-test score data. The test results are determined based on the probability obtained through the Kolmogorov Smirnov Test on data from the four groups shown in **Table 3.**

Table 3. Analysis Results of Treatment and Control Group Normality Tests on the Eco-literacy Answer Score Data

One-Sample Kolmogorov-Smirnov Test					
		Treat_Pre	Treat_Post	Ctrl_Pre	Ctrl_Post
		25	25	25	25
Normal	Mean	82,88	89,44	83,64	87,92
Parameters[a,b]	Std. Deviation	2,789	5,546	4,663	5,992
Most Extreme	Absolute	,157	,195	,131	,145
Differences	Positive	,083	,086	,103	,128
	Negative	-,157	-,195	-,131	-,145
Test Statistic		,157	,195	,131	,145
Asymp. Sig. (2-tailed)		**,113[c]**	**,016[c]**	**,200[c,d]**	**,183[c]**

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Source: Research Analysis, 2020

Based on the table above it can be viewed that the p-value is greater than 0.05; in accordance with the test criteria, then H_0, meaning that the data is normally distributed. After the normality test and the normal distribution of data, it is followed by a homogeneity test using the Bartlett Test. Homogeneity test was

carried out between the pre-test score of the experimental group and the pre-test score of the control group to test whether all the data groups had relatively equal (homogeneous) variance ranges. Homogeneity test results indicate that the data has a homogeneous range of variance. Because the data is normally distributed and has a homogeneous variant, it can be continued with the parametric statistical test that is t-test.

Table 4. Analysis Results of Different Tests in the Treatment and Control Groups

Test Group	n	df	Mean X	Mean Y	t_{cal}	t_{table} 0.05	0.01
Pre-Post Test Exp	50	48	82,88	89,44	7.032**	1.677	2.406
Pre- Post Test Contr	50	48	83,64	87,92	3.489**	1.677	2.406
Post test Exp- Contr	50	48	89,44	87,92	0.955ns	1.677	2.406
Gain Score Exper - Contr	50	48	6,56	4,28	1,507ns	1.677	2.406

** = Very Significant; ns = not Significant

Source: Research Analysis, 2020

Based on the above calculations that the results of the t-test of the Z generation students' eco-literacy between the post-test scores of the treatment group with the control (gain score) obtained t_{cal} 1.507 < t_{table} 1.677 (**Table 4**). This means that there is no difference between the treatment and control groups. In other words, the difference is not significant between the eco-literacy scores given by geoeco-books, even though the average score of the post-test treatment is higher (89.44) than students who do not use the geoeco-book (the average score of the post-test control score is 87.92) (**Figure 2**).
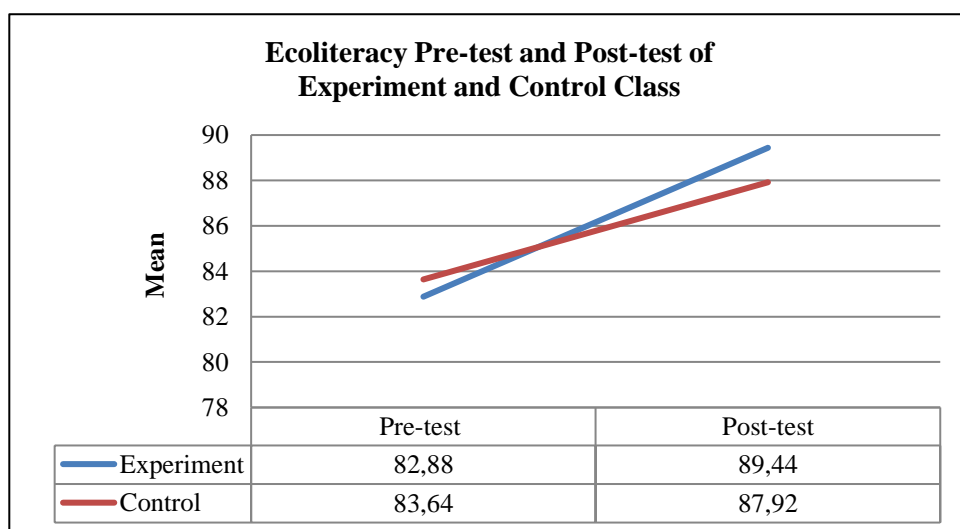

	Pre-test	Post-test
Experiment	82,88	89,44
Control	83,64	87,92

Figure 2. Pre-test – Post-test score of the Treatment and Control Group in the Effectiveness Test of Z Generation Student's Eco-literacy
Source: Research Analysis, 2020

Based on the data analysis of the results of the effectiveness test, it is obtained the results of research that answer the questions in the formulation of the problem as follows, that: (1) The geoeco-book instructional package model can improve the generation of students' Z generation (based on the average post-test), although not significantly. (2) The learning package model is effective in increasing the generation of students' eco-literacy. The findings of this study are supported by other studies such as research conducted by Craig & Allen (2015) with the title "The Impact of Curriculum-Based Learning on Environmental Literacy and Energy Consumption with Implications for Policy ". This research is related to energy efficiency program policies that use longitudinal designs and mixed methodologies to assess the effect of experiential learning on elementary schools on students' environmental literacy and energy saving behavior. The results of this study found that students significantly increased their environmental literacy. Another study was carried out by Hammond & Herron (2012) in her article entitled "The Natural Provenance: Eco-literacy in Higher Education in Mississippi".

Based on the results of this study, the researchers suggest that there is increased apathy in studying natural history in academic settings and in the scientific community. This study examines the level of eco-literacy in Mississippi, determines knowledge of local flora and fauna of undergraduate and graduate students at the largest universities. Eco-literacy rates in Mississippi are low. Students majoring in Wildlife and Fisheries and Biology have more advanced knowledge about local flora and fauna than non-biology majors. Students know best about reptiles and amphibians, and at least know about various species of fish and other species that are endangered. Environmental sensitivity is positively correlated with eco-literacy, and is a strong predictor of eco-literacy.

Based on the results of research conducted by Kulnieks, Longboat, & Young (2013), entitled "Eco-Literacy Development through a Framework for Indigenous and Environmental Educational Leadership") it was found that the conceptualization of the eco-mentorship program could advance the framework which enables innovation in environmental studies, environmental justice education, scientific

environmental knowledge that is part of a broader eco-literacy and environmental curriculum in Ontario. Exploration of the application of a framework for environmental learning involves eco-hermeneutic practices and the making of historical and etymological relationships. Saribas, Teksoz, & Ertepinar (2014) in his article entitled "The Relationship Between Environmental Literacy and Self-Efficacy Beliefs Toward Environmental Education" which investigates the relationship between environmental literacy and their self-efficacy beliefs. The sample for this study consisted of 61 students in 2 years at the Department of Basic Education of a private university in Turkey. The results showed that participants did not have adequate environmental knowledge or self-efficacy beliefs related to environmental education, although environmental attitudes, concerns, and perceptions of environmental issues were relatively high. The results also show a significant correlation between self-efficacy beliefs and their concern for the environment. The author concludes that the quality of environmental education in teacher education programs in Turkey needs to be improved.

Spinola (2015) in his research entitled, "Environmental Literacy Comparison Between Students Taught in Eco-Schools and Ordinary Schools in The Madeira Island Region of Portugal" found that the Eco-School Program was considered the largest environmental education program in the world for school, but continues to grow without evidence of its effectiveness in increasing environmental literacy. This study compares the level of environmental literacy on Madeira Island (Portugal) among 9th grade students from elementary schools and ordinary schools. It applies a questionnaire with three components, addressing knowledge, attitudes and behavior towards the environment. The results showed that environmental literacy among 9th grade elementary school students was not much higher than in ordinary schools. However, there are some environmental literacy features that are slightly better in Eco-Schools, namely in knowledge, attitudes and behavior.

Based on the findings, it was concluded that the Eco-School Program was actually not a better environmental education strategy than other strategies implemented in ordinary schools. Nevertheless, this study failed to show the reasons for the results obtained

because design research was inadequate for this purpose.

Referring to the research results above, it can be concluded that in increasing eco-literacy, predictor factors such as self-efficacy, beliefs, learning packages also influence and need to be considered. It is appropriate that environmental education learning tools, including learning packages used, are not enough to merely present knowledge, but need to be developed learning packages that involve students to actively learn in the construction of knowledge and eco-literacy, and the development of skills the other. The emphasis of learning is not only on mastering the concepts, but changing students' attitudes and weaknesses to be more concerned with environmental issues, able to apply the principles of sustainability, environmental morals, and environmentally responsible behavior.

CONCLUSION

The development of geoeco-book learning packages is designed based on the design of instructional models that are based on the objectives of environmental education and analysis of material on basic ecology. The substance of the material developed is adapted to the level of needs of Z generation students. Whereas environmental conditions and environmental phenomena are used as sources of learning. In an effort to improve eco-literacy of Z generation students, it is necessary to develop an ecology-based environmental education instructional package (geoeco-book). The instructional package for environmental education based on the basic concepts of ecology that was developed has the effectiveness in increasing the generation of students' Z generation eco-literacy although it needs further improvement and modification. Development of instructional packages, then given some suggestions for improving research, including the following: (1) It is necessary to re-organize environmental education courses in the Basic Education curriculum so that graduates produced have high eco-literacy; (2) It is necessary to conduct research that involves different samples both millennial generation, alpha generation and others with larger numbers both in the experimental group and in the control group; (3) Further research needs to be done on the use of instructional packages in the learning process not only in primary schools but also at the level of early childhood education, secondary to

tertiary education, to improve eco-literacy by using other instructional packages or other approaches that can affect effectiveness and the efficiency of instructional packages in increasing eco-literacy.

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