Inventory Analysis of Learning Environment through Dilemma Stories in Value-Based Chemistry Learning in Senior High Schools in Jakarta

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Abstract

This study aims to analyze an inventory of the learning environment through dilemma stories on value-based chemistry learning in high schools. The research was conducted in the 2019 academic year. There were 425 students of public high school and private high school in Jakarta. In learning about plastic with dilemma stories, an inventory of the learning environment is analyzed using the Chemistry Values Learning Environment Survey (CVLES) model which consists of: feelings related to dilemma stories, content of dilemma stories, teacher support, collaboration, empathy communication, critical thinking, plastic contextual chemistry . The results with factor analysis show that the two dominant factors that represent the overall parameters of the learning environment are feelings about the dilemma story and the content of the dilemma story.
Keywords: dilemma stories, plastics, CVLES, factor analysis

1.Introduction

Learning environment refers to the various physical locations, contexts and cultures in which students learn, as they can learn in a variety of settings, such as locations outside of school or social environments as well as online learning environments. The learning environment statement states that students learn in various ways in different contexts, the teacher and students create a learning environment to optimize student abilities.

In developing an effective learning environment, it includes the characteristics of students, learning objectives, activities that support learning, appropriate assessment strategies, and culture. According to Terry Heick (2014), there are several characteristics of an effective learning environment including students asking more from the teacher, ideas coming from different sources, using various learning models, authentic and transparent assessments, and learning habits that are modeled constantly. The learning environment can be a classroom environment or the class social climate, is the center of student learning, and activities in the learning process (Cornelius White, 2007).

Students feel comfortable studying in a classroom with a good social climate. Thus, the social climate or classroom climate in the learning environment becomes a part that needs to be considered and considered in the learning process, so that the learning objectives that have been prepared can be achieved, and students learn in comfortable situations that are supportive, challenging and motivating.

The required learning environment must be adjusted to the goal. For example according to Janer et al (2020) for the required learning environment, classroom has air conditioning, comfortable chairs, it is wide bright and has sound insulation panels. Meanwhile, Soyi and Annemarie's (2020) research results on master nurse students show that the learning environment required is clinical placement, leadership, communication, relationship, attitude and material resourcess.

21st century learning requires a learning environment that is physically needed to provide students with a sense of comfort. Sezary and Magdalena's (2019) research results show that the physical learning environment that students want is: building both exterior and interior, entrance zone, classroom, dedicates space, and internal circulation.

In this study, the Chemistry Values Learning Environment Survey(CVLES) instrument was used to measure the values and impacts felt by students when learning took place using the dilemma stories approach. The inventory of the learning environment that became the research material was adapted from the 6 indicators in CVLES, plus 1 dimension of the chemistry material according to the curriculum that applies to learning in class XII, namely plastic material. These dimensions are: Feelings related to dilemma stories, Dilemma story content, teacher support, cooperation, empathy communication, reflective thinking and plastic contextual chemistry.

To find out the dominant factors in explaining the values and impacts felt by students when learning takes place using the dilemma stories approach, the factor analysis method is used. With factor analysis canexplains the relationship between a number of variables that are independent of one another so that the resulting set of variables is less than the initial number of variables.

In his research Puddephatt et al (2020) regarding the factors that influence food selection from 12 measured variables, after a factor analysis test was carried out, it was found that the factors that influence someone to choose food are found that income was the biggest factor influencing food choice and eating behavior in food -insecure populations with other issues such as the cost of food, accessibility to shops and health issues. Jin Seng (2020) analyzes the factors that influence land use by the Shanghai government. The results of the research show that the results of the factor analysis, the dominant factors that determine land selection are the area of land, distance between the land and the city center, distance between the land and the district center, real estate price, GDP, paid-in foreign investment, tenure of party secretary of the district, promotion of district major to party secretary of the district, and industrial park have significant effects on the choice of the government on leasing land to different types of land uses in Shanghai. In this study, factor analysis was used to Analyze the dominant value obtained by students in learning plastic material with dilemma stories.

2. Method

The research was carried out in the 2018/2019 academic year. This research was conducted on State Senior High School students and private high schools in Jakarta. This type of research is a qualitative type. Research variables include: feelings related to dilemma stories, dilemma story content, teacher support, collaboration, empathy communication, critical thinking, contextual chemistry.

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The research procedure was carried out in two stages, namely preliminary activities and research implementation activities. Preliminary activities include making and assessing dilemma stories, validating research instruments. In the implementation stage, the teacher teaches the topic of polymer with stories about plastics followed by interviews with students. Student activities are doing quizzes, test learning outcomes; fill out the CVLES questionnaire and write a reflective journal.

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Data collection technique

The required data were obtained through interviews, filling out the CVLES questionnaire, reflective journals and classroom observations. The data analysis technique is based on qualitative data analysis. The validity of the data (quality standards) used is trustworthiness trust). The credibility used in this research is prolonged engagement, progressive subjectivity and member checking.

Data analysis

The data obtained were analyzed with the factor analysis method to determine the learning environment factors obtained by students during learning about plastics with dilemma stories. Data analysis consists of: (i) calculating the correlation matrix using the Bartlett test of spermicity and MSA (Measure of Sampling) measurement, (ii) Extraction or Factoring, using Principal Component Analysis (PCA), (iii) determining the number of factors that most effect by looking at the eigenvalue> 1. (iv). Rotating factors to clarify the position of a variable using the varimax method. (v). Interpreting the factors

3. Result and Discussion

Learning environment factors obtained by students in learning plastic material with storie dilemmas can be known by using the factor analysis method. The results of the factor analysis test consist of:

3.1 Correlation test and the feasibility of a variable.

Correlation test used Barlett's Test (Bartleet's Test of Sphericity) and Kaiser Meyer olkin Measure of Sampling Adequancy (MSA). To test the correlation between variables because the desired result in factor analysis is a high correlation between variables, it has a high correlation if the Banrlett value count> Barlett table, or the p-value (sig) <(0.05), it shows the correlation value. between variables and the process can be continued. The test results are shown in Table 1

Table 1 KMO value and Bartlett's Test of Sphericity

No	Parameter		Value
1	Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.815
2	Bartlett's Test of Sphericity Approx.	Chi-Square	524.472
		df	28.00
		sig	0.000

Based on Table 1, it is known that the KMO MSA value is 0.815> 0.50 and the Bartlett's Test of Spericity (Sig.) Value is 0.000 <0.05, thus the variables are correlated and can be further processed.

3.2. Measure of Sampling Adequancy (MSA) test.

The MSA test is a test used to measure the homogeneity between variables and to determine which variables are suitable for use in factor analysis, so that only the variables that meet the requirements can be further processed. Where the MSA value is 0.5 - 1.0. With the following criteria:

- MSA = 1 the variable can be predicted without error by the variable other.
- MSA = 0.5 variable can be predicted and can be analyzed further.
- MSA = 0.0 variable is unpredictable and not analyzed further and excluded from other variables

The MSA test results are shown in Table 2 below

Tabel 2 Result of MSA

No	Variable	SMA value	Standard value minimum
1	feelings related to dilemma stories,	0.842	0.5
2	content of dilemma stories	0.823	0.5
3	teacher support	0.806	0.5
4	collaboration,	0.814	0.5
5	empathy communication	0.838	0.5
6	critical thinking	0.850	0,5
7	plastic contextual chemistry	0.737	0.5

Based on the MSA value of each variable with the following results: Feelings related to Dilemma Stories are 0.842, Dilemma Story Contents are 0.823, Teacher Support is 0.806, Collaboration is 0.814, Communication Empathy is 0.838, Reflective Thinking is 0.850, Styrofoam Contextual Chemistry amounting to 0.704, Plastic Contextual Chemistry of 0.737. From these results it is known that all variables have MSA values> 0.50; thus it is feasible to do a factor analysis.

3.3 Factoring or extraction process

The factoring or extraction process is the process of separating variables that meet the correlation from the MSA value, where a variable is said to be correlated if the MSA value is greater than 0.5. The method used is Principal Components Analysis (PCA). The number of variables to be extracted is shown in Table 3

Table 3 Contribution of Extraction Results

No	Variable	Initial	Extraction
1	feelings related to dilemma stories,	1.000	0.465
2	content of dilemma stories	1.000	0.363
3	teacher support	1.000	0.539
4	collaboration,	1.000	0.506
5	empathy communication	1.000	0.447
6	critical thinking	1.000	0.428
7	plastic contextual chemistry	1.000	0.615

Based on the data in Table 3 above, it can be seen that the variables that have an Extraction value> 0.50 are contextual plastic chemistry, Teacher Support, Collaboration, so that the three variables can be used to explain the factors.

Furthermore, from Table 4, it will show more specific extraction results using the Principal Components Analysis (PCA) method. It can be seen that the Eigenvalue value is greater than or equal to 1.0. The specific results of PCA extraction are shown in Table 4

Table 4 Hasil Ekstraksi PCA

No	Component	Total	% of Variance	Cumulative%
1	1	2.830	35.380	35.380
2	2	1.145	14.317	49.697
3	3	0.837	10.457	60.154
4	4	0.732	9.116	69.301
5	5	0.716	8.915	78.217
6	6	0.636		85.490
7	7	0.509	6.365	1008.243

Based on the data in Table 4. "Initial Eigenvalues" above, there are two factors that are formed from the 8 variables analyzed. The Eigenvalue value for Feelings related to Dilemma Stories is 2.83 or> 1, it becomes a factor of 1 and is able to explain 35.38% of the variance. While the Eigenvalue value of the Dilemma Story Content is 1.15 or> 1, it becomes a factor of 2 and is able to explain 14.32% of the variance. The cumulative variance explained by the eight CVLES dimensions is 49.70%. While 50.30% of the variance was not found, it can be assumed that the unaccounted variance caused by measurement error or the actual variance was exclusive to each item (Jaeger 2010).

To show the number of factors formed, you can use the Scree Plot image, by looking at the point value of the component which has an Eigenvalue> 1.

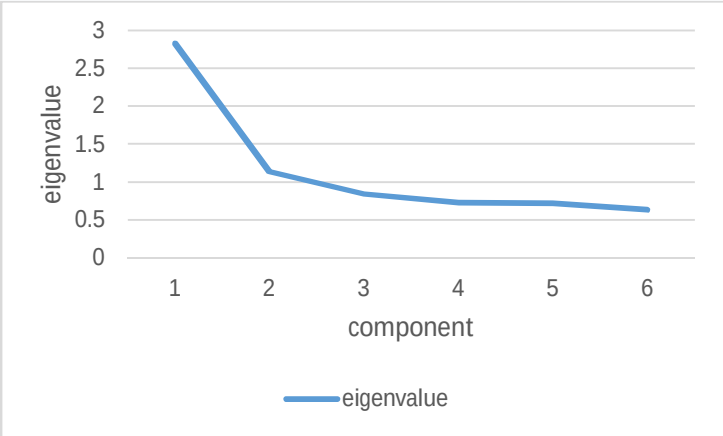

Figure 1 Scree Plot

In Figure 1 above, there are 2 component points that have an Eigenvalue> 1, which means that 2 factors are formed.

3.4 Factor Rotation

The variables that have been extracted will be rotated because usually the placement of the variables is not correct or there are still variables that do not match the factors. The rotation process is carried out on variables that pass the MSA test. The component matrix can determine the contribution of variables to the formed factors. The distribution of variables is shown in Table 5. Component Matrix before Variam rotation shows that each variable is in each factor group

To show the correlation value between each variable and the formed factors, it can be seen in Table 5 matrix components.

Table 5 Component Matrix before variant rotation

No	component	Component 1	Component 2
1	feelings related to dilemma stories,	0.669	-0.131
2	content of dilemma stories	0.601	0.400
3	teacher support	0.734	0.001
4	collaboration,	0.659	-0.269
5	empathy communication	0.646	-0.175
6	critical thinking	0.605	-0.248
7	plastic contextual chemistry	0.389	0.681

In Table 5 above, it can be seen that the correlation value of the Feelings Related to Dilemma Stories with factor 1 is 0.669, and the correlation with factor 2 is -0.131.

From the results of the factor component, it is still difficult to determine the right position for the variable, for example the Feelings variable related to Dilemma Stories with a factor of 1 is 0.669, and the correlation with factor 2 is -0.131.Therefore, the factor component must be rotated. Factor rotation will clarify the position of a variable without seeing the largest loading value without seeing (+) and (-). The Component Matrix after rotation shows the distribution of 7 variables to the 2 formed factors. The rotation results can be seen in Table 6

Tabel 6 Component matrix after rotation

No	component	Component 1	Component 2
1	feelings related to dilemma stories,	0.671	0.119
2	content of dilemma stories	0.547	0.254
3	teacher support	0.685	0.265
4	collaboration,	0.711	-0.015
5	empathy communication	0.665	0.680
6	critical thinking	0.654	-0.015
7	plastic contextual chemistry	0.118	0.775

From table .6 it can be seen that:

- The Feeling Variable Related to the Dilemma Story, the correlation value is with a factor of 1 = 0.671 and a factor 2 = 0.119, because the correlation value for factor

1> factor 2 means that the variable is included in the factor group 1. Likewise with the variable Dilemma Story Content, Teacher Support, Cooperation, Empathy, Communication and Reflective Thinking, including factor groups 1.

- Plastic contextual chemistry variables, the correlation value with a factor of 1 = 0.118 and a factor of 2 = 0.775, then the variable is included in the factor group 2

The components of the Transformation Matrix are used to determine the value of the relationship between the formed factors, where the value must be> 0.5. Table 7 shows that component 1 has a correlation value of 0.933 and component 2 has a correlation value of 0.933. Because the correlation value of the two components is> 0.5, the two factors formed can be concluded that it is feasible to summarize the seven variables analyzed.

Tabel .7 Component Transformation Matrix

component	1	2
1	0.933	0.359
2	-0.359	0.933

Table 7 above shows that component 1 has a correlation value of 0.933 and component 2 has a correlation value of 0.933. Because the correlation value of the two components is> 0.5, the two factors formed can be concluded that it is feasible to summarize the eight variables analyzed.

From the results of the CVLES reliability and validity test, it was found that Cronbach's Alpha value was 0.723> 0.66 with 8 variables. So it can be concluded that these dimensions or variables are declared consistent or reliable for use in research. The findings from the factor analysis show that from 8 variables 2 factors and 23 items can be formed that can explain the inventory for dilemma stories in the learning environment.

3.5 Students' perceptions of their learning environment

The results of implementing the CVLES instrument on students' perceptions of the learning environment are presented in Table 8.

Table 8 Students' perceptions about the learning environment

No	component	value
1	feelings related to dilemma stories,	4.54 0.55
2	content of dilemma stories	5.00 ± 0.00
3	teacher support	4.37± 0.64
4	collaboration,	4,10 ± 0.82
5	Empathy communication	4.22 ± 0.73
6	critical thinking	4.20 ±0.65
7	plastic contextual chemistry	4.37± 0.85

The relatively high mean score on the Empathic Communication scale ($\bar{x}$= 4.52) indicates that students generally agree that they learn to respect other (different) learners. The relatively high score on the Teacher Support scale ($\bar{x}$ = 4.37) indicates that students generally agree that they feel well supported by their teachers in this new learning environment. Relatively high mean scores on all other scales indicate learners' generally positive ($\bar{x}$> 3.5) perceptions of the ethical values of their learning experiences, a result consistent with qualitative analysis.

Reference

Cezary Szpytmaa, Magdalena Szpytma.2019. **Model of 21st century physical learning environment (MoPLE21).** *Thinking Skills and Creativity*.**34**.100591

Cornelius White, 2007.Learner-Centered Teacher-Student Relationships Are Effective: A Meta-Analysis, *Review of Educational Research* **77**:113-135

Janer Varón Arenasa, Henry Arley Taquez Quenguanb,Nathalia Salazar Fallaa, Diana Salazar Ulloaba.2020. Characterization of the learning environment of anInternal Medicine course for medical students of ICESI University of Cali, Colombia. **EducaciónMédica**

Jin Seng Analyzing the factors influencing the choice of the government on leasing different types of land uses: Evidence from Shanghai of China. *Land Use Policy*.**90**.104303

Maindhard, Tim, Pj, Brok Den, Brekelmans M., Wubbels, Theo. (2011, July). The development of the clasroom social climate during the first months of the school year.https://*www.researchgate.net/publication/247328819*

Micheal. (2016). Engaging Students Through The Use of Dilemma Stories. www.goconqr.com. https://www.goconqr.com/en/blog/the-importance-of-teaching-valuesin-education/.

Puddephatt J.-A., Keenan G.S., Fielden A., Reeves D.L., Halford J.C.G. & Hardman C.A., .2020. Eating to survive': A qualitative analysis of factors influencing food choice and eating behaviour in a food-insecure population, *Appetite* **147**.104547

Soyi Joyce Mosiaa, Annemarie Joubertba Primary healthcare practice learning environment: A description of students'perspectives. nternational .*Journal of Africa Nursing Sciences*.**13** : 100230

Settlemaier, Elizabeth. (2003). Dilemmas with dilemmas Exploring the suitability of dilemma stories as a way of addressing ethical issues in science education. Paper presented at the annual meeting of the National Association for Research in *Science Teaching. Philadelphia*, March 23-26, 2003.

Settlemaier, Elizabeth Taylor, Peter Charles & Julia Hill. (2010, June). Supporting Teachers, Challenging Students Socially Responsible Science for Critical Scientific Literacy. Paper presented at the *14th annual conference of the International Organization of Science & Technology Education (IOSTE XIV*), Bles, Slovenia, 13-18 June 2010.

Taylor,Elizabeth, Taylor, Peter Charles and Chow, Mei Ling. (2013). Diverse disengaged and reactive. A Teacher's adaptation of ethical dilemma stories pedagogy as a strategy to re-engage learners in education for sustainability (pp. 97-117).

Terry Height, 2014. Technologies to Help Students Find Their Voice in Your Classroom .*Edutopia*