

Text mining of children's essays  
about animals kept at schools  
focusing on importance of life and  
attachment to animals

K.Hori

(Seigakuin University)

T.Ito

(Wako University)

T.Ando

(Yokohama National University)

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# Research Background

## Rearing Activities for School Animals in Japan

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Keeping animals at schools in Japan

→An attempt that began in Meiji era. However, structural systems to incorporate such activities into school education is still insufficient.

From around 1980s,

veterinarians spontaneously began providing support in caring for school animals at their neighboring elementary schools. Ex. The Tokyo Veterinary Medical Association. **→As a part of their support project, they collected and published children's essays from model schools.**

**To examine the significance of animal rearing activities in school education.** →These children's essays are effective materials for analysis.

# Significance of the Research: Analysis of Essays

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Analysis of Essays: Generally focuses on sentence composition and comprehension abilities

→ Evaluation criterion change according to the developmental stages. Difficult to compare.

To investigate the significance of animal rearing activities: Must examine the actual experience of children while considering their different developmental stages.

Method to examine the significance of animal rearing experience from essay analysis

=Utilization of text mining

Enables an exploratory examination on the significance of animal rearing experience, interaction with animals, development of feelings and affection, development of inter-human communication ability through animal caretaking activities, etc.

# Research Objective

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To analyze children's essays from model elementary schools with text mining, and conduct an exploratory investigation about what interest the children had in animals, what activities they were involved in, what feelings animal caring activities generated.

# Method

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Research Object: “Essays From Model School Project for Rearing School Animals” 4 Volumes, (2001-2004), prints 386 essays by elementary school students

Research Method: Converting essay contents into text data, and conducting analysis on content words with text mining methods.

Utilized Software: Text Mining Studio Ver.4.1 (Mathematical Systems Inc.)

# Result 1: Basic Information

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- Target essays: essays written by 386 students
- Average character count per person: 326.3 characters
- Average sentence length: 14.6 characters for one sentence
- Total number of content words: 50417 words
- Total number of different words: 5313

# Result 2: Number of Essays Among Class Grades

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Table1. Number of essays among class grades

<b>Grade</b>	<b>Number of essays</b>
1 <sup>st</sup>	41
2 <sup>nd</sup>	95
3 <sup>rd</sup>	26
4 <sup>th</sup>	87
5 <sup>th</sup>	54
6 <sup>th</sup>	82
Unknown	1

Table2. Number of essays among higher and lower class grades

<b>Grade</b>	<b>Number of Essays</b>
Lower Grades (1 <sup>st</sup> ~ 3 <sup>rd</sup> )	162
Higher Grades (4 <sup>th</sup> ~ 6 <sup>th</sup> )	223
Unknown	1

# Result 3: High appearance words and commonly used words

Table 3. High appearance words

<b>Word</b>	<b>think</b>	<b>rabbit</b>	<b>prese nt</b>	<b>do</b>	<b>say</b>	<b>animal</b>	<b>banta m</b>	<b>cleani ng</b>	<b>care</b>	<b>cute</b>
<b>Word Class</b>	verb	noun	verb	verb	verb	noun	noun	noun	noun	adjec tive
<b>Appea rance Frequ ency</b> (N umber of Words)	1185	1116	434	424	400	365	357	317	298	293

Table 4. Commonly used words

<b>Word</b>	think	rabbit	present	do	say	cute	perfor m	See	good	school
<b>Word Class</b>	verb	noun	verb	verb	verb	adjecti ve	verb	verb	adjecti ve	noun
<b>Number of users (persons)</b>	310	215	209	183	182	181	161	158	156	152



# Result 4: Nouns = Topics and themes

Table 5. Usage frequency of Nouns

Frequently used general nouns among **higher** grades (Chi-squared test,  $p < .05$ )

	Word	Word Class	Attribute Frequency	Total Frequency	Index Value
1	Animal	Noun	114	115	24.972392
2	Shed	Noun	70	70	16.604236
3	Rearing shed	Noun	64	64	15.170692
4	Bantam	Noun	71	73	12.697738
5	Cleaning	Noun	116	125	11.545253
6	Committee	Noun	37	37	8.743799
7	Friends	Noun	33	33	7.795
8	Animals	Noun	27	27	6.373408
9	Vegetables	Noun	25	25	5.899972
10	Summer vacation	Noun	48	51	5.767514

Frequently used general nouns among **lower** grades (Chi-squared test,  $p < .05$ )  
There were no distinguishable differences among words

## 単語頻度表

	Word	Word Class	Frequency
1	Rabbits	Noun	210
2	Food	Noun	162
3	School	Noun	145
4	L	Noun	135
5	Animal	Noun	129
6	Person	Noun	120
7	I	Noun	105
8	Shed	Noun	104
9	Name	Noun	95
10	Water	Noun	94
11	Chicken	Noun	88
12	Bantam	Noun	78
13	Beginning	Noun	78
14	Dung	Noun	76
15	Teacher	Noun	73
16	Oneself	Noun	66
17	Hands	Noun	62
18	Female	Noun	58
19	House	Noun	58
20	Outside	Noun	56

# Result 5-1: Verbs = Actions

Table 6. Usage frequency of verbs

	Word	Word Class	Frequency
1	Present	Verb	239
2	Do	Verb	179
3	In that way	Verb	163
4	Perform	Verb	155
5	See	Verb	141
6	Enter	Verb	126
7	Think	Verb	122
8	Give	Verb	116
9	Die	Verb	107
10	Eat	Verb	103
11	GO(Chinese character )	Verb	102
12	Come(Japanese character )	Verb	95
13	Not + in that way	Verb	95
14	Come(Chinese character)	Verb	89
15	Can become	Verb	87
16	Can enter	Verb	82
17	Endeavor	Verb	80
18	Touch	Verb	80
19	Say	Verb	71
20	GO(Japanese character )	Verb	68

# Result 5-2: Usage frequency of verbs among higher and lower grades

High group of usage frequency elicited from gap between expected value and actual value of verb usage frequency calculated from population ratio.

Table 7. Usage frequency of verbs among higher and lower grades

Frequently used verbs among **higher** grades  
(Chi-squared test,  $p < .05$ )

	単語	品詞	属性頻度	全体頻度	指標値
1	Enter	Verb	122	130	46.680749
2	Do	Verb	160	182	38.698083
3	End	Verb	50	50	25.548141
4	Deem	Verb	95	109	21.142215
5	Judge	Verb	38	38	19.416587
6	Have	Verb	33	34	14.904684
7	Think	Verb	31	32	13.882758
8	Teach	Verb	44	49	12.696917
9	Want + do best	Verb	31	33	11.925669
10	Want + do	Verb	38	42	11.588229
11	Know	Verb	26	27	11.327944
12	Put in	Verb	71	84	10.836197
13	Do best	Verb	74	88	10.411996
14	Put out	Verb	38	43	9.63114
15	No + do	Verb	22	23	9.284093
16	Give birth	Verb	17	17	8.686368
17	Begin	Verb	17	17	8.686368
18	Take	Verb	17	17	8.686368
19	Understand	Verb	55	65	8.53206
20	Be born	Verb	28	31	8.435691

Frequently used verbs among **lower** grades  
(Chi-squared test,  $p < .05$ )

	単語	品詞	属性頻度	全体頻度	指標値
1	Touch	Verb	35	83	43.971918
2	Play	Verb	27	74	28.826164
3	Go	Verb	22	59	24.150345
4	Put	Verb	17	38	22.540303
5	Give	Verb	32	115	20.21695
6	Say	Verb	22	68	19.55168
7	Come	Verb	40	156	19.011893
8	Present	Verb	50	209	16.611387
9	Perform	Verb	30	113	16.302771
10	See(kanji)	Verb	36	144	15.271238
11	Stand	Verb	14	41	13.603257
12	Shake	Verb	8	13	13.101902
13	Sleep	Verb	10	23	12.928379
14	Pet	Verb	11	28	12.841617
15	End	Verb	11	30	11.819691
16	Catch	Verb	10	26	11.39549
17	Run	Verb	6	7	11.231574
18	See	Verb	12	36	11.221967
19	Want+ play	Verb	7	12	11.144813
20	Be pleased	Verb	8	17	11.058051

# Result 6: Adjectives = Feelings and evaluation

Table 8. Usage frequency of Nouns

Frequently used adjectives among **higher** grades  
(Chi-squared test,  $p < .05$ )

	Word	Word Class	Attribute Frequency	Total Frequency	Index Value
1	Hot	Adjective	25	25	8.423115
2	Many	Adjective	31	32	8.280363
3	Scary	Adjective	54	62	4.96959

Frequently used adjectives among **lower** grades  
(Chi-squared test,  $p < .05$ )

	Word	Word Class	Attribute Frequency	Total Frequency	Index Value
1	Warm	Adjective	19	33	19.318296
2	Cute	Adjective	63	178	11.713769
3	Quick	Adjective	2	2	6.071312
4	Shameful	Adjective	2	2	6.071312
5	Friendly	Adjective	5	9	4.585787
6	Red	Adjective	8	17	4.554922
7	Interesting	Adjective	12	29	4.336277

	Word	Word Class	Frequency
1	Good	Adjective	156
2	Cute	Adjective	154
3	Happy	Adjective	133
4	Amazing	Adjective	132
5	Fun	Adjective	99
6	Sad	Adjective	70
7	Fast	Adjective	69
8	Small	Adjective	65
9	Big	Adjective	63
10	Scary	Adjective	60
11	White	Adjective	42
12	Kind	Adjective	37
13	Gentle	Adjective	37
14	Many	Adjective	33
15	New	Adjective	32
16	Warm	Adjective	31
17	Cold	Adjective	30
18	Stinky	Adjective	27
19	Interesting	Adjective	27
20	Lonely	Adjective	26

# Discussion 1

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**Nouns** (express topics and themes)→ Rabbits appeared frequently (from high appearance words and commonly used words).

**Verbs** (express actions)→ Both expressions of active expression and interest appeared. Estimated from combining analysis of usage frequency of verbs and subject-predicate relations among higher and lower grades.

(Higher grades) were characterized by active participation, like “joining the animal rearing committee,” (we) “feed” and “clean.”

(Lower grades) were characterized by expressions of interest rather than active participation, like “touch”(the animals), “play”(with the animals)” and “go” to the animal shed.

# Result 7: Matching frequency of subject and predicate words

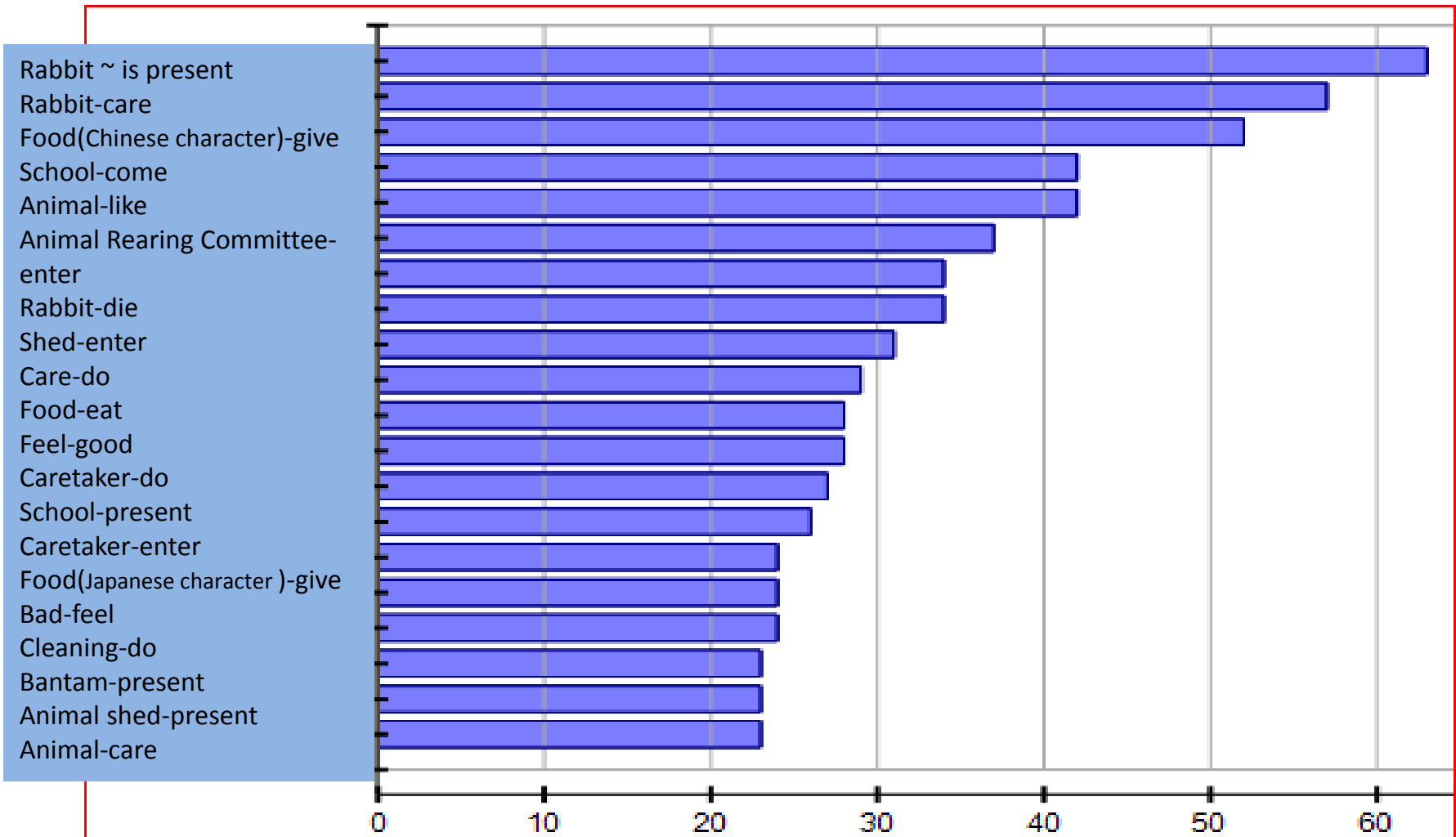


Figure 1. Matching frequency of subject and predicate words

# Discussion 2

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## **Adjectives** (express feelings and evaluation)

→ Feelings generated by keeping animals, and feelings experienced toward the animals were commonly positive.

(Feelings generated from keeping animals ) “good,” “happy,”  
“fun”

(Toward animals) “cute,” “amazing”

Comparison between word count of appearance frequency and commonly used language

→ Results reflected standpoints of “active participation” and “do not participate but show interest.”

**Overall, children were positive about animals and keeping animals regardless of their grades.**

# Result 8: Usage frequency of words among genders

Table 9. Usage frequency of words among genders

	s-girls	Index Value	s-boys	Index Value	s-unknown	Index Value
1	Love	17.8	Die	25.719	Recess	25.845
2	Outside	17.197	Deem	21.16	Water	25.75
3	Like	16.155	Do	19.5	Change	22.452
4	Eat	14.353	Go	14.452	Front	19.511
5	House	14.185	Work hard + want	14.059	Go out	17.814
6	6 <sup>th</sup> grade	12.224	Live	13.945	Put in	17.362
7	Touch + cannot	9.803	Task	13.716	Rearing	17.249
8	Touch	9.667	Teacher	13.64	Two people	16.325
9	Shed	9.523	Give to me	12.461	Strength	16.099
10	Can + not	9.356	Rabbit	12.305	Dislike	15.873
11	Well	9.064	Listen	11.496	Tasty	15.307
12	Think	9.056	Wear	11.293	Black	15.081
13	Perform	8.936	Day	11	Food	14.873
14	Present	8.497	Escape	10.404	Take	14.855
15	Person	8.473	Chicken(雞)	10.328	Interesting	14.741
16	Greenland	8.445	Take	10.126	Is there	14.534
17	Boss	8.445	Work hard	10.099	Two animals	14.289
18	Good	8.181	Rearing	10.099	One animal	13.837
19	Receive	8.149	Dung	9.592	Calm	13.723
20	Teach	7.854	Change	9.39	Chicken	13.384



# Result 9: Positive and negative common noun expressions

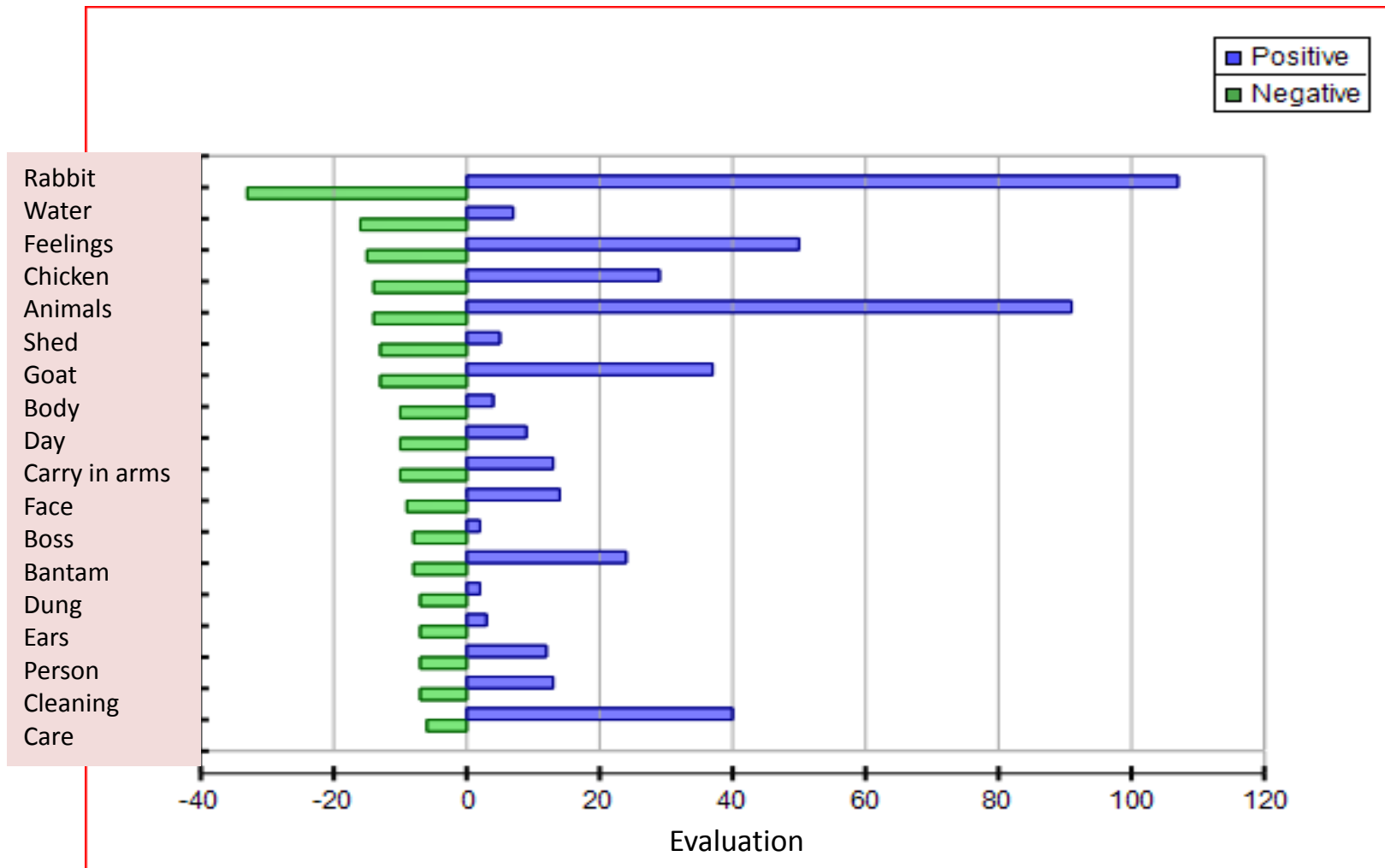


Figure 2. Positive and negative common noun expressions

# Discussion 3

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## 1. From usage frequency of verbs among genders:

Girls: Naturally had affectionate and nurturing point of view toward animals. Ex. “like (love)” “(animals) eat,” “touch,” “cannot touch,” “well,” “present,” “outside.”

Boys: Captured it as a task. Attained observations from continuously being around life and death. Ex. “I want to work hard,” “task,” “teacher,” “die,” “live,” “escape.”

## 2. From the sorting results of positive and negative depictions of nouns:

(Utilization of Text Mining Studio Ver.)

Rabbit→ Depicted most in both the positive and negative context.

Other nouns→Less negative expressions. Very positive expressions for nouns like feelings, animal, goat, bantam, care, etc.

# Conclusion and Future Tasks

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This research confirmed that children in “Model School Project for Keeping School Animals for Education” experienced:

- Accomplishment and being fond of taking care of animals.

- Labor participation and understandings of animals.

- Compassion for animals and others.

- Enjoyment in interacting with animals.

- Personified animals in perceiving happiness of animals.

- One’s own happiness and reflexivity.

Future Tasks :

Investigate the significance of schools with animal rearing education by comparing this research result to that of children without the experience of keeping school animals.