RISING TEACHER COMPETENCE THROUGH LESSON STUDY IN INTEGRATED SCIENCE EDUCATION WITH JELAJAH ALAM SEKITAR APPROACH

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Abstract: *Sciences teachers in Junior High School are generally Physics and Biology Education graduates. Whereas, 2013 curriculum provides Biology and Physics as an integrated subject, natural sciences. Hence, Physics Education graduates teachers have trouble in teaching Biology and vice versa. The purpose of this study is to improve the professionalism of the science teacher through the lesson study (LS). This research is an action research conducted in collaboration with the junior high school science teachers and post-graduate students of Science Education and Elementary Education program, Universitas Negeri Semarang. LS determined several topics which will be developed as a sciences learning kit for seventh graders of Senior High School. Implementation of the learning kit was also implemented by LS. The results showed that LS could improve the teachers' professionalism that includes the ability of teachers to prepare learning kit, implementing in the classroom using some innovative learning models and assessing the students. It is suggested that LS activities need to be developed and implemented consistently because it is effectively proven to improve the ability of teachers.*

Key words*: Integrated Science Instructional Model,* JAS *approach, Lesson Study.*

INTRODUCTION

Sciences education is expected as a tool for students to explore theirself, their environmental surroundings and further development prospect in their daily activity.The sciences learning process emphasises on direct experiences to evolve competences of exploring and conceiving natural surrounding scientifically. Sciences education is directed to do something and inquiry. Thus it helps students to deepen understanding of the natural surrounding. To bring this expectation into reality, sciences education in secondary school should be conducted as integrated sciences. By this approach, students could acquire integrated knowledge and experience thus enforce learned concepts' reception, retention and application (BSNP 2006).

Facts show that most of the science secondary teachers were Bachelor degree in Physics and Biology. Sciences education graduate is still limited. Therefore, science learning in the classrom is separated into Physics and Biology. The learning is also not challenging enough for students to think, make them enjoy it and only reproduce sciences concept from the teachers. This happened as the result of the limitation of teachers ability to convey knowledge, arrange learning to engage students to be active and increase curiosity which raises their learning motivation.

Sciences education is expected as a tool in exploring theirself and environment around them, and further development prospect in their daily activities. Its learning process emphasises on giving direct experiences to evolve students' competencies of exploring and understanding natural surrounding scientifically. Sciences education is directed to learning through inquiry and direct experience to get a deeper understanding of the nature.

The essence of sciences involves four main elements, i.e. sciences as attitudes, process, product, and application of scientific method and science concept in their daily activities. Those fourth elements are the characteristics of sciences which can not be separated each other. Learning sciences should be a direct interaction with the environment. Sciences which is learnt by only memorising tends to be boring. Sciences phenomenon can be seen and felt directly by students. The students can explore and investigate the nature to find the concepts. JAS learning is a learning concept which relates learning materials with the real situation and led them to correlate between knowledge and the application in their daily life as members of society.

JAS learning approach is one of biology learning approach innovation which has been developed by Biology educators of Sciences and Mathematics Faculty, UNNES. This learning approach has been examined from many aspects and finally used as a blazing biology learning approach. Other sciences, which employ environment and its simulation as learning source through scientific works with students centred learning, also apply the approach. It emphasises on the style of conveying material which includes its characteristic, range, and explorative activity procedures which give real experiences to the students (Marianti, 2006; Ridlo, 2005). JAS in its implementation is a joyful and fun learning strategy, which involves knowledge or sciences, inquiry process, creativity, collaboration, educational games, competition, challenge and sportive activity.

Lesson study among lecturers and teachers, then by teachers, improve teachers' competences and professionalism. LS is one of the teachers' professional development by studying

collaborative and continuous teaching and learning process based on collegiality and mutual learning to build a learning community. LS could apply various learning method or strategy according to learning environment and problems around the teachers. LS enables collaboration, not only between lecturers and teachers but also among teachers in their fellow or inter-school (Hendayana, 2007)

This case leads the researcher to conduct LS with junior high school teachers in developing integrated natural sciences learning by JAS approach. Lecturers and teachers collaborate each other to decide sciences concepts would be studied. Some observers, include teachers and their peers would assess model teacher. LS will improve learning quality, teachers' competences, and build learning community among teachers, headmasters, supervisors, and lecturers (Supriatna, 2007)

Developing of integrated sciences learning model can be done through LS collaboratively between lecturer and teacher to improve learning based on reflection or suggestion from the observers by focusing on how students learn. This research focus is to **implement JAS approach integrated science learning to improve teachers professionalism through Lesson Study**.

METHODS

This study is an action research by LS. In this Lesson Study, researchers collaborate with sciences teachers in developing integrated sciences learning kit based on previous need assessment.Then, it is validated and revised. The learning kit model used modified Wolter Dick & Lou Carey as represented in Figure 1.

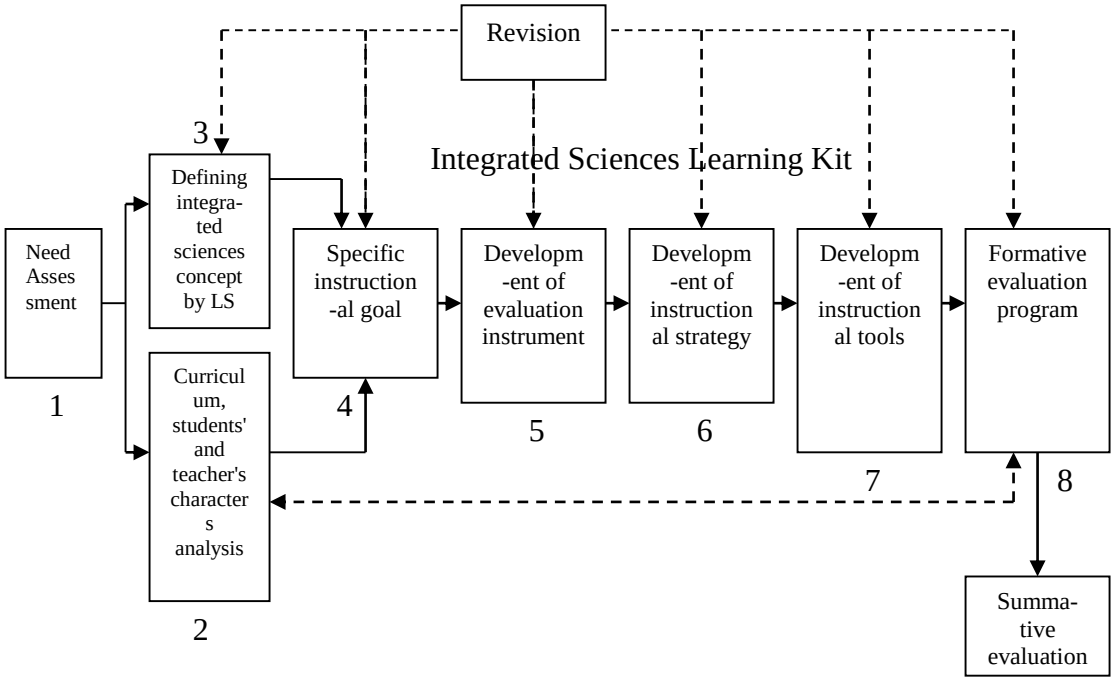
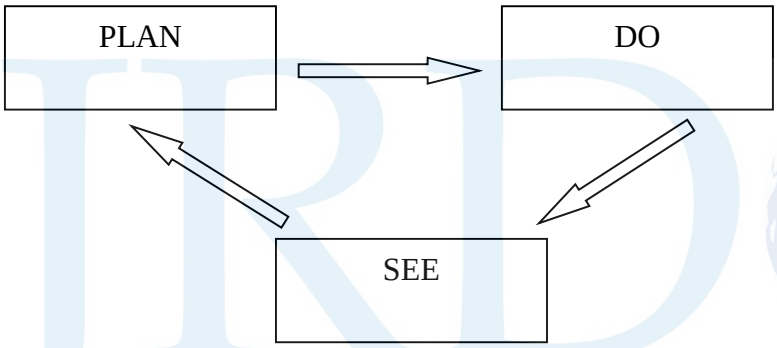


Figure 1. Dick and Carey Instructional System Developmental Model

The learning kit was then used in LS learning. LS is a teacher professional development model by studying learning process collaboratively and continuously based on collegiality and mutual learning to build a learning community. LS could apply various learning method or strategy according to learning environment and problems around the teachers. In its learning kit implementation, there are laboratory works, STAD, TGT, Discovery-Inquiry, and Problem-Based Learning (PBL). LS is done by three continous steps, that is, plan, do and see. LS activity scheme is seen in Figure 2.



Gambar 2. *Lesson Study* activity scheme

The improvement of teachers professionalism is identified from the learning quality, which should be in good or excellent category, students activity category during learning, where at least 80% of students are active and very active, and the learning outcome, where at least 85% students pass the evaluation.

RESULTS AND DISCUSSION

Need assessment, curriculum analysis, students' and teachers' characteristic were explored by questionnaires which given to senior high school teachers of a sciences teacher association in Semarang. The result was expected to give data of the urgency to develop the integrated sciences learning kit for seventh graders. We also analysed teacher's, students' characteristic and the curriculum. Table 1 shows the analysis of the questionnaire.

Table 1. Result of Questionnaire Analysis of Need Assessment

Aspect	No.	Description	*A/ SA/ %
Need Assessment	1	You think that integrated sciences learning is necessary	59.18
	2	You still need help in developing integrated science learning	67.34
	3	The integrated sciences learning helps students to comprehend the concept	59.18
	4	You still have trouble in applying integrated sciences learning	67.35
Students' and teacher's characteristics	5	Integrated sciences learning needs students' creativity and maturity	67.35
	6	Senior high school students are able to think abstractly and systematically	55.10
	7	A teacher in integrated sciences learning should be the educator as well as the supervisor	67.34
	8	A bachelor of sciences education for integrated sciences teachers' qualification is not a must	65.31
	9	Teachers of physics, biology, and chemistry should conduct a lesson study for a well managed integrated sciences learning.	69.38
Curriculum Analysis	10	You think that emphasizing scientific inquiry in a sciences learning is important to develop student's curiosity	87.76
	11	You think that identifying and using laboratory tools are students' competencies must be mastered	97.96
	12	Ecosystem concept involves study of living organism, dead thing, energy and its change	100
	13	Materi **ekosistem** mencakup bidang kajian makhluk hidup, benda-benda di alam (materi) serta energy dan perubahannya.	100
	14	Learning of interdependent relationship in the ecosystem triggers students' awareness to the environment	100

Based on the need assessment on Table 1, 59.18% of respondents said that integrated sciences learning need to be applied, but 67.34 respondents needed helps in developing and applying it. This opinion enforces the importance of this research. Integrated sciences learning was trusted by respondent help students to comprehend the concept.

Learning kit was arranged in an LS teachers association workshop. The first step was LS members discussion to map the standard and basic competences (SK, KD-Bahasa). The discussion gave six themes according to three topics taught in the first semester and three topics in the second semester of grade seven as follow:

a. Semester 1:
   1) BE FRIEND WITH SCIENCES LABORATORY
   2) HOW HAIL HAPPENED?
   3) HOUSEHOLD WASTE POLLUTION
b. Semester 2:
   1) COMPOSTING
   2) ENVIRONMENTAL DAMAGE AND LAND-USE CHANGE
   3) TEMPEH FROM SOYBEAN

Topics which are developed from daily phenomenon or process encourage students' curiosity and simplify their understanding.

The respondents who are mainly junior high school sciences teachers (69.38%) agreed with a collaboration of Biology and Physics teachers integrated science learning as the limited of sciences education graduated teachers. Therefore, LS group conducted a workshop to arrange a learning kit included the syllabus, lesson plan with students' worksheet, learning module, and its evaluation. Then it was sent to experts to be reviewed. Review from the experts is as Table 2 and 3.

Table 2 Lesson plan review*)

Lesson plan	Expert 1	Expert 2	Average	Conclusion
1	35	24	29.5	Poor
2	35	26	30.5	Poor
3	35	20	27.5	Poor
4	35	30	32.5	Feasible
5	35	31	33.0	Feasible
6	35	31	33.0	Feasible
7	35	31	33.0	Feasible
8	35	28	31.5	Poor
9	35	28	31.5	Poor
10	35	28	31.5	Poor
11	35	26	30.5	Poor
12	35	34	34.5	Feasible
13	35	34	34.5	Feasible

*) Criteria: The lesson plan is feasible if it is scored $\geq$ 32

Table 3 Teaching Material Review*)

Teaching material	Expert 1	Expert 2	Average	Explanation
A: content	3.625	2.5	**3.06**	Feasible
representation	3.56	2.5	**3.03**	Feasible
B: content	3.625	3.5	**3.56**	Feasible
representation	3.56	3.5	**3.53**	Feasible
C: content	3.625	3.5	**3.56**	Feasible
representation	3.56	2.8	**3.18**	Feasible
D: content	3.625	3.5	**3.56**	Feasible
representation	3.56	3.36	**3.46**	Feasible
E: content	3.625	3.25	**3.44**	Feasible
representation	3.56	3.4	**3.48**	Feasible
F: content	3.625	3.125	**3.375**	Feasible
representation	3.56	2.8	**3.18**	Feasible
G: content	3.625	3.25	**3.44**	Feasible
representation	3.56	3.2	**3.38**	Feasible
H: content	3.625	3	**3.3**	Feasible
representation	3.56	3	**3.28**	Feasible

*) Criteria: The teaching material is feasible if it is scored ≥ 3

Based on the suggestion of the experts, parts of lesson plan should be revised as follow: 1) Uniformity of each lesson plan identity; 2) Learning model, approach and the method were overlapped. Models should represent syntax of learning scenario, especially for the main activity, and 3) The assessment should refer to the learning goal.

The learning kit was revised till it was considered as feasible by the experts. Revised and feasible learning kit is then ready to be applied. Arrangement and revision of integrated sciences learning kit were done through LS activity. A model teacher was chosen to apply integrated sciences learning kit developed under peer teachers/ observation (in LS group). Observation of students' activity during learning is represented by Table 4.

Table 4 Percentage of students activity during LS learning process by LS

NO	Observed Aspects		SCORE BY THE OBSERVER		
			AVERAGE OF MEETING I (%)	AVERAGE OF MEETING II (%)	AVERAGE OF MEETING III (%)
A	Students-students interaction				
	1	Collaboration	76.70	84.64	97.23
	2	Respect to others' opinion	70.07	77.00	88.81
	3	Share knowledge with others	69.84	78.02	88.37

NO		Observed Aspects	SCORE BY THE OBSERVER		
			AVERAGE OF MEETING I (%)	AVERAGE OF MEETING II (%)	AVERAGE OF MEETING III (%)
	4	Work ingbased on job desricption in their group	72.41	79.71	90.34
	5	Sharing ideas or opinion in a group discussion	78.02	82.08	86.91
	6	Seizzeing initiative in solving problems	76.93	78.24	88.60
		Average of students' interaction	73.99	79.95	90.04
B	Students-learning material interaction				
	7	Preparing learning material in the beginning	70.08	78.48	92.90
	8	Utilising learning material in doing the group task	69.65	75.31	92.91
	9	Using more than one of learning materials	46.13	58.05	84.35
	10	Recording information from learning material on their notebook	59.53	67.33	90.53
	11	Utilizing learning material to make conclusion	72.43	77.60	87.50
		Average of students-learning material interaction	63.57	71.35	89.64
C	Students-teacher interaction				
	12	Giving a response to teacher's apperception	65.10	76.72	89.47
	13	Answering teacher's question	67.46	73.49	92.90
	14	Asking a question to the teacher	54.68	71.09	86.43
	15	Asking the teacher for a help to overcome their learning obstacle	60.88	66.40	86.68
	16	Responding teacher's clues in making conclusion of the concept	62.50	73.15	87.08
		Average of students-teacher interaction	62.12	72.17	88.51
		Total average	66.56	74.49	89.40

Referring to Table 4, on students activity aspect of students' interaction with their peers, known that average score of the first meeting is 73.99%, the second meeting with 79.95%, and the last meeting 90.04%. There is a rise in quality of collaboration among students, appreciating argumentation, sharing knowledge, work based on their job description, giving ideas, and on solving problems. Its criteria raised from high to be a very high category.

Based on the aspect of the interaction between students and learning material, it is known that average score in the first meeting is 63.57%, the second meeting is 71.35%, and the third meeting is 89.64%. There was a rise in quality of learning material preparation until its utilisation in making conclusion. Students had not been asked to bring other learning sources, except developed learning material. They were allowed to bring and use other references, includes an article from a web-page, and other relevance references at the second and third meeting.

In the aspect of students-teacher interaction, the study got score average of 62.12% for the first meeting, 72.17% for the second meeting and 88.51 for the third meeting. Raising occurs on the percentage of the harmonious interrelationship between students and teacher. This good relationship would improve learning quality.

Teacher's performances in learning process strongly define learning goal achievement. A teacher who can conduct a joyful learning will affect students' achievement. This is because of students' internal motivation to comprehend the concept given by the teacher. The result of teacher's performance observation is at Table 5.

Table 5. Percentage of teacher's performance in LS learning process

NO	Observed Aspect			Percentage of scores by observers		
				Average of Meeting I	Average of Meeting II	Average of Meeting III
1	Pre-learning					
	1		Motivating students	89.10	89.10	100.00
	2		Giving apperception	82.85	90.77	96.94
	Average of pre-learning			85.98	89.93	98.47
2	Main learning activity					
	A	Learning Concept Mastery				
		3	Showing learning concept mastery	94.58	94.58	100.00
		4	Relating the concept with other relevance knowledge and the reality	94.86	94.86	99.63
		5	Clearly explain the concept as learning hierarchy and students' characteristic	96.25	96.25	97.29
		6	Relating concept with realities	91.53	96.53	68.61
		Average		94.31	95.56	91.38
	B	Learning model mastery				
		7	Conducting learning as competences to be achieved and students' characteristic	91.81	91.81	100.00
		8	Sequentially conduct the learning	86.25	91.81	98.96

NO	Observed Aspect			Percentage of scores by observers		
				Average of Meeting I	Average of Meeting II	Average of Meeting III
		9	Classroom management	86.67	96.94	98.33
		10	Conducting contextual learning and triggering positive habits of the students	85.77	95.56	98.33
		11	Conducting learning as planned time allocation	86.32	93.82	94.86
		12	Conducting problem based learning holistically and collaboratively	93.13	93.61	100.00
		Average		88.32	93.92	98.41
	C	Learning source/ media consolidation				
		13	Using media effectively	85.28	91.67	97.57
		14	Delivering interesting message	84.52	93.82	100.00
		Average		84.90	92.74	98.79
	D	Trigering and maintaining a well regulated learning				
		15	Encouraging active participation, cheerfulness, and enthusiasm of the students	90.81	96.53	100.00
		16	Showing openness to students' responses	88.40	97.57	98.96
		Average		89.61	97.05	99.48
	E	Assessment of learning process and outcome				
		17	Monitoring students' ability during learning	85.07	95.49	97.57
		18	Doing summative assessment as learning competences goal	96.25	96.25	97.29
		Average		90.66	95.87	97.43
	F	Language use				
		19	Using clear and appropriate spoken and written language	83.89	95.14	96.53
		20	Delivering message with appropriate style	89.44	95.49	98.61
		Average		86.67	95.31	97.57
	Average of main activity			89.08	95.08	97.18
NO	Observed aspect			Average of Meeting I		
				Average of Meeting I	Average of Meeting II	RERATA PERTEMUAN III
3	Closing					
	21	Making reflection or summary by engaging students		82.54	89.65	95.90
	22	Giving a follow up by giving learning brief, activity or task as a part of remedial or enrichment process		85.90	89.65	95.90
	Average of closing			84.22	89.65	95.90
	Percentage of Teachers' performance average			86.42	91.55	97.18

The learning activity included Pre-learning, main and closing activities. Table 5 shows that teacher' performances in planning, executing and evaluating learning activities, raise significantly. The language aspect gave the raise of 10.9% since the first until the third meeting. It represents teachers' professionalism in mastering concept and delivering it with a clear and understandable spoken and written language. Teachers need an ability to organise concept to help students understanding. The rise of teacher's competence is seen in Figure 3.

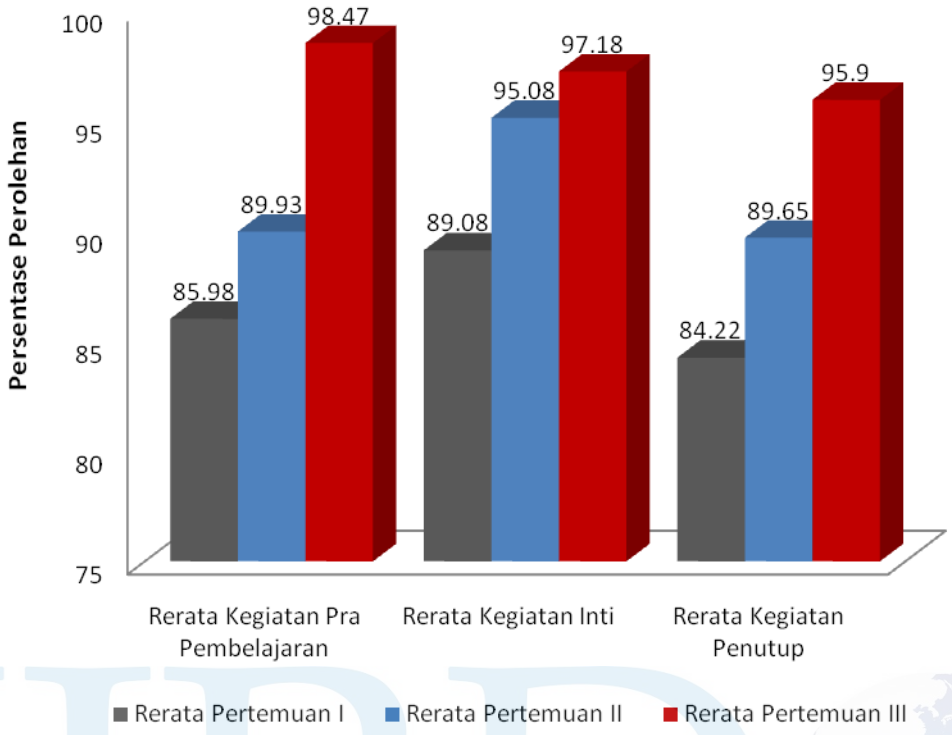


Figure 3. Percentage of teacher's performance in JAS approached PBI learning model

Bogner (2007) declared that LS is a method which has been employed in Japanese educational system to assess students in a learning process. LS involves teachers and the stakeholder in a collaborative activity to observe their educational processes and explore it to derive suggestion and solution in reconstructing further learning process, thus it is succeed improving teachers' performance (Isoda *et al.* 2007).

Based on the experience of Biology Department of Unnes, which had conducted LS at SMA 16 in 2006, it was proven that LS can improve teachers' performance as a classroom organiser. This is supported by research of Roshayanti & Rita (2008) which showed that LS in micro-learning could develop prospective Biology teachers' competences. LS is an open-classroom activity to be observed by peer teachers or stakeholders. In this activity, learning exploration and collaboration are done continuously based on collegiality and mutual learning principles to build a learning community (Hendayana, 2006).

Reflection in LS, widely teaches us about some efforts in improving learning quality, where the most crucial thing is focusing on teachers to observe themselves or their peers (Fernandez, 2003). Teachers should collaborate each other as a team to create a fine learning environment

(Windarso,2008). It is reinforced by Winarsih (2009), who was able improving sciences teachers' professionalism of SMA N 30 Semarang by showing the rise in the percentage of pedagogical, professional, personal and social score achievements. The rise was mostly because the existence of reflective activity to reconstruct further learning process.

As stated by Bellisimo (2000), learning which activates students, is focused on real problems around them to attract students interest and restrain their boredom. Students who actively involved in the learning defines their interest thus improves their understanding. The The observed students were attracted doing observation and discussion in solving their daily problems, arguing each other, sharing knowledge as well as ideas. They also developed a great collaboration when discussing solution for the problem based on what they wrote in previous observation.

CONCLUSION

Conclusion

This study concludes that Lesson Study effectively improved teachers' professionalism, which involves pedagogical, professional, personal and social competences. It also improved the quality of learning process in the classroom.

Suggestion

The Lesson Study needs to be expanded and done consistenly for it is effective to improve teachers' competences continuously. It can be done both at school level and at local teachers' association. It is recommended to do that in collaboration with lecturers from higher education to enrich innovative learning material and method. It is also such a good deal for the lecturers to directly explore how teaching and learning at school is. Thus they can arrange lecture as it is needed in the real context. Lesson study will create mutual learning and learning community. It should be conducted as a routine agenda and well planned to get the best result. It also needs a big support of the principle to conduct lesson study at the school.

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