effectiveness learning based project assisted interactive media to care ability

cooling system
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Abstract. Mistake procedure of cooling machine maintenance on light vehicles often done of students of class XI Technical Light Vehicle (TKR / Teknik Kendaraan Ringan) in SMK N 3 Semarang. There are indications that the learning process is more dominated by teachers with direct delivery, less active students to explore theoretical concepts and self-care procedures. By direct delivery can also be accepted by students is less clear because it can not be repeated. This study aims to determine the effectiveness of learning-based project assisted interactive media to the cooling system maintenance capabilities. Experimental research conducted on students of class XI TKR-1 SMK N 3 Semarang as experimental group and class XI TKR-2 as control group. Data obtained through the test of knowledge and performance test. The results show that interactive media-based project-based learning is more effective than direct learning, as evidenced by the average knowledge and skills of 79 and 84 respectively from the direct learning of 75 and 79, with \( t_{	ext{tung}} \) for knowledge of 2.334, \( p = 0.023 \) and \( t_{	ext{tung}} \) for skill of 2.739 with \( p = 0.008 \).

Keywords: project-based learning, interactive media, cooling system maintenance

PRELIMINARY

The ability to perform cooling system maintenance is one of the competences that must be mastered by light vehicle engineering students. Solving the problem is an important part to master when working or opening your own business. This is in line with the challenges of learning in the 21st century that learners to be able to collaborate, solve problems, think critically and think creatively (Mukminan, 2014; Afandi, et.al, 2016). Responding to these challenges according to Trilling & Fadel (2009) in Afandi, et.al (2016), learning should experience paradigm shifts into student-centered learning, interactive learning, optimizing skills, processes, from basic skills shifted on applied skills, from material-based switching to project-based, collaborative and learning to life.

A learning strategy that fosters students seeking knowledge on themselves and demonstrates what has been known with a variety of presentations (NYD Department of Education, 2009: 8). Project-based learning serves as a reference for the development of creative and updating abilities because it is seen as having effective characteristics that lead students to invest in important ideas and questions, framed through discovery processes, able to accommodate differences in student needs and interests, lead to freedom in making products or services and presentations that exceed the expectations of teachers, require the ability to think creatively, critical thinking, the ability of information to find and write conclusions and present the material and related to real and authentic issues and the latest issues (NYD Department of Education, 2000: 8). According to Bell (2010), project-based learning is an innovative approach to learning that teaches many important strategies for achieving success in the 21st century, as students are encouraged to learn through problems, collaborate to research or create projects that reflect their knowledge.

This paradigm shift and the use of project-based learning is highly relevant to learning in Senior High School with the ability to renew and create the key elements. To make it happen, support from various parties is needed.

Cooling system maintenance is part of the basic competence of machine maintenance that must be mastered. But the fact that there are still many students when faced with real problems in a lightweight engine experience a mistake in performing the procedure, less able to solve problems that arise in the cooling machine maintenance. There are indications due to the lack of application of project-based learning, as long as this learning is still dominated by teachers through direct learning. Master directly became the speaker and demonstrator of cooling machine maintenance, lack of consideration of appropriate media usage, and less invited students to explore their own knowledge from various sources. As a result, the memory obtained is instantaneous. Therefore it is necessary to do interactive project-based interactive learning project.

Research by Wekesa and Ongunya (2016) provides empirical evidence that the use of project-based learning facilitates learning with higher quality and influences on learning achievement. Learning is done into a student-centered approach that influences the change in student attitudes that contribute to improved learning achievement. Another study by Ilter (2014) concludes that project-based learning can create a more positive effect on achievement of student learning outcomes and conceptual motivation. Through learning, students become responsible and active in making
correct decisions; furthermore, they become independent learners and thinkers by participating in real-world projects actively because they are able to develop their own world by increasing their knowledge, skills. The Chiang & Lee (2016) study provides empirical evidence that project-based learning significantly affects the learning motivation and problem-solving abilities of vocational students.

Interactive media is a media conveyor of information that contains the material more fully because it not only presents the materials in writing, but equipped with video, along with tools evaluation. Psychologically according to Megrabian (1981) in Cai & Abbott (2013), 93% of a person’s communication is done non-verbally, because the human brain is more receptive to simultaneous object images than in a linearly inclined language. Through more real, contextual images in the video can help remove obstacles in receiving messages. Through visualization, the issues and opinions can be more easily understood by the students. Video is an effective information delivery tool. Nevertheless, the use of video alone is less effective than the combination of demonstrations through video and teacher Cai & Abbott, (2013).

It can be predicted that through learning assisted by interactive media will give a more active influence on the ability of cooling system maintenance of students of class XI TKR SMK N 3 Semarang.

This strategy that fosters students seeking knowledge on themselves and demonstrates what has been known with a variety of presentations (NYD Department of Education, 2000: 8). Various studies have shown that project-based learning has a positive impact on the development of learners from various aspects, cognitive, attitudes and skills.

Through project-based learning the students no longer become passive recipients of knowledge, as they gain deep experience, are able to integrate the knowledge they have gained with the new knowledge they acquire, are able to establish cooperation, and closer to real-world problems (Riosa, et. al, 2010; Grant, 2002). Students engage in intellectually challenging tasks that encourage the investigation of problems through the process of knowledge and skills to solve complex, non-routine problems, which increase the pleasure and confidence in performing the applied scientific procedures (Movahedzadeh, et.al, 2012; Tanim, 2013), and have an impact on student academic achievement (Du & Han, 2016). Project-based learning focuses more on communication, students focus more on paying attention to their message delivery and at the same time students apply the knowledge they gain (Thitivesa, 2014).

Research Doppelt (2003) shows that the motivation and self-image of all levels have increased. In such learning, teachers change their role in the classroom into creative mentors who foster student competencies. The Lasauskiene & Rauduvaite (2015) study concludes that there is a positive feeling from teachers in applying project-based learning and creating sustained student upgrading.

RESEARCH METHODS
The experimental research was conducted in class XI TKR SMK N 3 Semarang academic year 2017-2018. As an experimental group conducted interactive media-based project-based learning is the students of class XI TKR 1 while the students of class XI TKR 2 as a control group. The data taken in the form of the ability of knowledge and skills of cooling system maintenance obtained through the test of knowledge and performance test. The data obtained were analyzed using independent sample t-test.

RESEARCH RESULT
Knowledge of Cooling System
The result of the test of cooling system knowledge through online test result showed that in the experimental group as much as 15% still unfinished, 76% of students were categorized as complete and 9% were categorized in good category. In the control group, 38% of students were still incomplete, 59% complete in enough category and 3% complete in good category, as shown in Table 1.

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<th>Interval</th>
<th>Criteria</th>
<th>Experiment</th>
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<td>&lt; 75</td>
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<td>5</td>
<td>13</td>
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<tr>
<td>75-83</td>
<td>Enough</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>84-91</td>
<td>Good</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>92-100</td>
<td>Very good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Amount</td>
<td></td>
<td>34</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>79</td>
<td>75</td>
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<td></td>
<td>SD</td>
<td>5,9</td>
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Judging from the average, cognitive ability about cooling system treatment in experimental group is 79 while control group is 75. At 5% error rate obtained $t_{max} = 2,334$ with significance value $0,023 <0,05$, which means that there is significant difference of ability cognition between experimental and control groups. It can thus be concluded that interactive media-based project-based learning is more effective than direct learning of the cognitive abilities of cooling system care materials.

Cooling System Maintenance Skills
The results of performance tests on cooling system maintenance showed that in the experimental group as much as 18% is still not complete, 24% of students are categorized as complete, 35% of students are complete and 24% are considered very good. In the control group, 35% of students were still unfinished, 26% complete in enough category, 32% complete well and 6% complete very well, as stated in Table 2.

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Viewed from the average, cooling system maintenance skill in experiment group equal to 84 while control group equal to 79. At 5% error level obtained tcoun value = 2.739 with significance value 0.008 <0.05, which means that there is significant difference of system maintenance skill cooling between the experimental and control groups. Thus it can be concluded that interactive media-assisted project-based learning is more effective than direct learning of the cooling system maintenance capabilities.

Project-based learning conducted in the experimental group is more dominated by student activities. Through interactive media, students do an exploration of cooling system material and its components. Media equipped with text and video on cooling systems, maintenance procedures make it easy for students to understand concepts and procedures. Through interactive media, students can repeat things that are still considered difficult to look back at the text or video that is displayed. Exploration through interactive media as a reference in carrying out cooling system maintenance project procedures consisting of setting goals, project planning, carrying out maintenance activities and conducting assessments. Cognitive assessment is done directly through online that is available in interactive media, while the skill assessment is a performance test on the machine maintenance procedure.

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