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Research title	Research of entrance examinations with an emphasis on experimentation and theoretical thinking focusing on cooperation between upper secondary schools and universities
Period	FY2011 (April 2011 -- March 2012)
Objectives	<ol style="list-style-type: none"> <li>(1) Understanding the current circumstances of university entrance examinations emphasizing experimentation and theoretical thinking.</li> <li>(2) Opinion survey of high school teachers regarding actual state of scientific experimental research at high school and university entrance examinations that consider factors such as experimentation.</li> <li>(3) Implementation of model lessons emphasizing experimentation and theoretical thinking through cooperation between high schools and universities.</li> </ol>
Methodology	<p>We conducted a questionnaire survey of teachers at high schools where students had received science awards. It includes the actual state of scientific experimental research at high schools and teachers' opinions regarding entrance examinations emphasizing experimentation and theoretical thinking.</p> <p>We also conducted a study of the national universities' AO entrance examinations emphasizing experimentation and theoretical thinking. Additionally, we held workshops with high school teachers and exchanged opinions regarding these entrance examinations and regarding experimentation emphasizing theoretical thinking at high schools and in universities.</p> <p>From the viewpoint of the cooperation between high schools and universities, we conducted model lessons in chemistry, biology, and physics, emphasizing experimentation and theoretical thinking in a joint effort between high schools and universities.</p>
Major outcomes and findings	<ol style="list-style-type: none"> <li>(1) Even at high schools where students had received science awards, despite seemingly having active science-related club activities, there are not many such activities and club members. There is a tendency that such high schools with many science-related clubs and active club members are found only among specific high-performing schools.</li> <li>(2) Teachers tend to heavily involve themselves in identifying the research themes and supervising essay writing for students, with not many instances of students finding their own subjects and conducting research themselves. There is a tendency of excessive involvement of teachers.</li> <li>(3) High schools with science award winner students have strong desire for appraisal of students' research activities at school and for AO entrance examinations to be arranged so that students' experiences in experimentation would be useful.</li> <li>(4) There are very few cases of entrance examinations of national universities in which experimentation or evaluation of research activities conducted at high schools are involved. It is only limited to the AO entrance examinations of a very few universities.</li> <li>(5) Many first-year university students lack confidence in experimentation. This is due to the fact that they do not have sufficient experience or knowledge of scientific experiments. This is in turn ascribed to the students' lack of experience in everyday life as well as in experimentation at high school. Also, some teachers themselves actually lack the experience and knowledge of experimentation.</li> <li>(6) It is possible, in liaison between teachers of high schools and universities, to implement model lessons for high school students to improve their theoretical thinking with a focus on experimentation, or provide them with opportunities to experience research at universities.</li> </ol>

Contributions to education policy	<ol style="list-style-type: none"><li data-bbox="384 197 1406 293">(1) Appraisal of science research activities at high schools and promoting the appraisal to be included in the assessment of university entrance examinations will help to encourage high schools to engage in more science-related activities.</li><li data-bbox="384 300 1406 465">(2) Workshops for teachers of lower secondary schools and high schools should be provided in cooperation between universities and boards of education, to conduct model lessons facilitating more experimentation and improvement of theoretical thinking. This will improve teachers' abilities and skills in conducting and instructing experiments at lower secondary and high schools.</li><li data-bbox="384 472 1406 638">(3) Leveraging a public system of liaison between high schools and universities, such as the Science Partnership Project, opportunities should be given to high school students to experience not only experiments but also research projects at university. This will help the students to enhance their capabilities in experimentation and theoretical thinking.</li></ol>
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