(Source: https://scholarsteamk12plus.weebly.com/guidelines-for-pedagogic-experiments.html)

WORKING FOR AN INNOVATION DEAL USA IN THE 21ST CENTURY
TRABAJANDO POR UN TRATO DE INOVACIÓN EEUU EN EL SIGLO XXI
为实现 21 世纪美国创新之政而奋斗

GUIDELINES FOR PEDAGOGIC EXPERIMENTS

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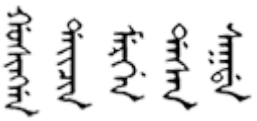

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PEDAGOGIC PILOT STUDIES

The proposed K12 engineering pilot studies: This pedagogic pilot studies is aimed at answering the questions of "To what degree could high school students master selected pre-calculus engineering topics which up to this point, are taught only to college engineering students?" In this part of the SCHOLAR STEAM K12 Plus Project, high school age-possible engineering topics from college engineering textbooks and associated materials would be tried in K12 classrooms. This part of the SCHOLAR STEAM K12 Plus Project could last 3 to 4 years. Teams of two engineering instructors could conduct, observe and analyze pedagogic experiment to test the age-appropriateness of carefully selected sets of engineering topics with K12 students. Under supervision from experienced college engineering and technology professors, graduate students working on Master of Science Program in Engineering from local four-year universities could be recruited, trained in K-12 engineering and technology pedagogy, and serve as Teaching Assistants. Topics from the proposed courses listed under the Research Outcomes section of this website could be used to teach age-possible engineering knowledge content to a randomly selected group of high school students enrolled in engineering and technology career pathways, from Greater Los Angeles Area. As much as possible, student population would be selected from diverse academic, economic and ethnic backgrounds (preferably from schools with substantial percentage of economically and academically disadvantaged and under-privileged groups, such as students from low-income White working families, Native-, Latino-, African-, and Asian-American families), with a substantial number of female students. The pilot testing could be conducted first as summer camp learning activities before it moves into former K12 classrooms. The high school age-possible engineering knowledge could possibly include (1) pre-calculus level engineering analytic principles and computational skills, and (2) high school age-possible models of engineering design process, such as "creative, conceptual and light analytical," "engineering and technology experiment," "analytic reduction" for "well-structured design problems," and "system thinking" for "ill-structured" and "capstone" projects.

The potential impact of the K12 engineering pilot studies: Outcomes from the pedagogic pilot studies of the proposed SCHOLAR STEAM K12 Plus

Project could help locating areas in need of improvement in both pedagogy and the development of digital instructional materials in the proposed K12EngineeringDeal.com website.

CROSS-INSTITUTIONAL COMPARATIVE STUDIES ON ENGINEERING ANALYTIC AND PREDICTIVE KNOWLEDGE CONTENT

Research participants: Pre-calculus Level Engineering Examination for the proposed courses listed under the Research Outcomes section of this website, with format and degree of difficulty similar to those found in the Engineers-in-Training Examination and Fundamentals of Engineering Examination, would be designed and conducted with the following two groups of students, under similarly controlled conditions to test and compare their mastery of the essentials of relevant engineering analytic and predictive skills: (1) the same randomly selected group of high school students enrolled in engineering and technology career pathways, from Greater Los Angeles Area; and (2) randomly selected group of engineering students from local colleges and universities.

Research method: The comparative analysis of the outcomes of the pedagogic pilot studies, from both qualitative and quantitative perspectives, could help to reach a more or less systematic understanding of the ability of K12 students to master the essentials of the pre-calculus portions of engineering analytic and predictive skills from the proposed courses listed under the Research Outcomes section of this website, which is up to this point reserved for college engineering students, and provide useful first-hand data for the improvement of K-12 engineering pedagogy, for the purpose of addressing the challenging question of "How can all students be assured the opportunity to learn significant STEM content," in the area of high school age-possible engineering analytic and predictive skills.

CROSS-INSTITUTIONAL COMPARATIVE STUDIES ON ENGINEERING DESIGN ABILITIES

Cross-Institutional Engineering Design Competition: The same groups of students could participate in an engineering design competition, under similarly controlled conditions (including design requirements, materials used, evaluation criteria, etc.), using similar sets of pre-calculus level engineering knowledge content from the same proposed courses listed under the Research Outcomes section of this website, and designing simple products

for everyday usage, using the same “system thinking,” ill-structured, multi-disciplinary model of engineering design process. The competition could be judged by the same group of jurors to be randomly selected from engineering professors and practicing engineers from the Greater Los Angeles Area. The outcomes of the competition could help to address the challenging question of "How can high school students apply engineering analytic and predictive knowledge content in real-world like product design?"

Research method: The comparative analysis of this competition, from both qualitative and quantitative perspectives, could help to reach a more holistic understanding of the ability of high school students to apply the pre-calculus portions of engineering knowledge content from the proposed courses listed under the Research Outcomes section of this website in the design of real world like products (in comparison with the ability of college students), and provide useful first-hand data for the improvement of K12 engineering pedagogy, in the area of generic engineering design process.

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