How to develop Students' Engineering Thinking in Robotic Education

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Good morning, ladies and gentlemen/ honorable professors and all my new friends

I am a robotics teacher in high school from China. I am honored to have the chance to share my opinions towards robotic teaching and STEAM education. Now I would like to present my paper, "How to develop students' engineering thinking in robotic education".

Robotics is a systematic and highly comprehensive subject which is related to the knowledge and skill in control, machinery, electron, computer, engineering, sound, light, electricity and magnetism. Developing students' ability of applying knowledge in STEAM education to robotic engineering design is the most prominent feature in robotic education. Then knowledge and skill in science knowledge, as well as the management field will be used in organizing, designing, planning and managing of a robotics program by students. It provided strong teaching material for high comprehensiveness and openness of robotic education. So, I think robotic education is one of the students' key courses in STEAM education. Now I would like to briefly speak about how to develop students' engineering thinking.

As we all know, considering the problem in real life will be an essential part during students' design and putting up in a robot program. Thoughts dominate your thinking. While, the defining characteristics of engineering thinking is reality and integration. It's a way of thinking which has high comprehensiveness to resolve the problem in real life. It's the openness and un-unity in robotic education, which make teachers have more various teaching

design. So it can provide better designing environment for students and get the most out of cultivating and experiencing students in engineering thinking. Thus, How to develop students' engineering thinking in robotic education? My presentation will include the following three parts.

First, we should choose teaching program according to systematic method

Engineering is a complicated system which consists of knowledge, technology, humanities, environment and so forth, emphasizing on its logic and systematic nature. So it's the same with engineering thinking. When we are engaged in robotic teaching, besides the age and knowledge skills characteristics of students, it requires the teacher considering all the internal logic relation and the whole systematic characteristics into choosing teaching program.

Second, follow engineering thinking to organize teaching content

Robotics course is a technical subject which is mainly as an optional course without united teaching material, which offers bigger space for robotic teaching. To be clear, the teacher must strictly follow teaching object to organize teaching content. The teacher cannot entirely follow the construction manual to organize the classes, not even consider the robotic courses as special competition courses. We should develop students' comprehensive qualities，stimulate their interest for study and focus on their autonomy and subjective activity. On these basis, we need to specifically organize teaching content according to different teaching objects.

Third, to win dynamic balance between activities and teaching

Engineering thinking is a classic practical thinking which forms, develops and must get the conclusion from practice. But theoretical thinking is a kind of cognitive thinking way that can strictly the conclusion according to logical deduction.

Developing engineering thinking is a process of applying, transferring and constructing knowledge during the practice. So we teachers should change the traditional teaching idea which put practicing after lecturing. "Practice---lecture--practice again---summary at last" can be adopted in teaching. The teacher can pose a practical problem or task for students, then make it clear that the overall goals and time requirement. Let students analyze task, design and action program. In the meanwhile, the teacher is needed to control the process of teaching, master best timing to teach the knowledge and skill that students should master and finally help them to transfer and recombine the knowledge. After finishing the task, helping students to finish the whole constructive process, the teacher should uniformly sort and explain the knowledge involved again. Finally, we will realize the teaching object--"learning by doing" and achieve the perfect combination between development of engineering thinking and knowledge explaining.

OK, thank you very much for your kind attention! Thank you! (simile)