

A riddle about the World Year of Physics

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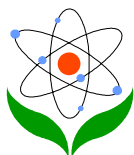
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Abstract

In order to propagate information on the World Year of Physics (WYP) and to promote students' appreciation of the significance of this event, the author devised a riddle about Einstein and implemented it at two high schools in Taiwan, with 95 students participating in the activity. In the riddle, nine clues were given one by one to the students, which were mainly based on Einstein's publications in 1905. During the game, 81% of the students responded in the game, and 64% gave the correct answer: Einstein. According to the responses, the riddle seemed to effectively draw students' interest and attention to the incoming event of the WYP. Based on this study, three implications to physics teaching and learning were given.

A Riddle about the World Year of Physics

After the great event of "the world year of physics" (WYP) was announced, I tried to design a way of presentation, which could better inspire students' curiosity and



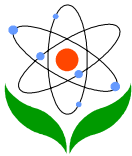
appreciation of the background of this event and its significance, rather than just forwarding the information. As stated by the European Physical Society^[1], the purposes of initiating the WYP are to arouse the public's awareness regarding the importance of the development of physics (or physical science) for our daily life, and to encourage more students, at high schools and universities, to enroll in the subject of physics. Therefore, convincing students to comprehend the significance of this event should be more important than only passing the related science knowledge directly to them.

I initiated a game of solving a riddle, which was to guess the name of a person from the nine clues disclosed one by one. Each student was allowed to make only one guess throughout the disclosing process. When being a guest instructor funded by an innovative teaching project, I conducted the riddle game in two high schools. Totally 95 students participated in the game. The clues and the number of students who gave correct responses are listed in Table 1 ^[2, 3]:

Table 1: The clues of the riddle and numbers of the correct response

	clue	correct responses	accumulation of correct responses
1.	1905	0	0
2.	Avogadro's number (dimensions of molecules)	0	0
3.	Age 26	2 (2%)	2 (2%)
4.	Brownian motion (existence of atoms)	0	2 (2%)
5.	Nobel prize	1 (1%)	3 (3%)
6.	inertia and energy	0	3 (3%)
7.	photon	14 (15%)	17 (18%)
8.	Person of the Century	33 (35%)	50 (53%)
9.	time dilatation	11 (12%)	61 (64%)

In addition to the 64 % of students giving the correct response, Einstein, there were 16 (17%) students, who gave wrong answers. The other most popular answer was "Newton" which was surely a surprise to the author, considering the time discrepancy



between Newton's age and the given clue of 1905.

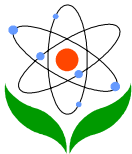
Three implications can be made based on the students' responses. First, although the facts of Einstein's "Miraculous Year" in 1905 were stated in their physics textbooks, the students appeared to have taken little notice of this information. Learning history of science seemed to be just a subsidiary task for these students when learning physics. Second, most of the students may know more about Einstein's contributions in modern physics (clues #7 and #9), than to classical physics (clues #2 and #4). Third, despite the fact that $E = mc^2$ has been well-known as a genius discovery by Einstein, clue #6 appeared to provide little help to reveal the answer. Thus, the students were found to fail to conceptualize the famous formula of $E = mc^2$ as transformation between inertia and energy.

The game took about 15 minutes, then I spent the next 15 minutes introducing details regarding the "Miraculous Year in 1905 as well as the WYP in 2005. At first, I gradually disclosed the answer, by integrating the clues, with an introduction on the theories relative to Einstein's achievement in 1905. Then, several contemporary applications in technology, related to these theories were introduced, in order to highlight the impact of these theories on our current society, e.g., clock corrections of global positioning systems contributed by the relativity (clue # 9)^[4], and the invention of electrical appliances due to the development with respect to laser technique (clue # 7). Finally, based on clue #8, the impact of the development of physics knowledge to the whole world in the 20th century were elaborated^[5].

It was enjoyable to see that most of the students were highly engaged in the session. And, hopefully, the teaching design can help them to appreciate Einstein's and all scientists' contributions to the world, the significance of the WPY, and most importantly, the crucial role of physics for our current society and the future.

Acknowledgements

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