

Excerpts from the Masterclass 2011: Survey Results

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(Excerpts by Marge Bardeen)

The report is based on aggregated data for all masterclass (MC) sites. It also is based on some information about the lowest rated and highest rated sites in order to try to discern what might make an effective MC. There were 320 surveys from 21 sites. Of the 312 students who addressed the question, 180 were male and 132 female. The survey was modeled after the European MC survey and adapted for use with this year's U.S. MC. Last year we added a teacher survey to determine what, if anything, teachers were doing to prepare students for MC.

Masterclass Success Factors

The following focuses on criteria that lead to successful masterclass experiences for students and teachers. The factors for a successful MC are now well known. Those sites that did not follow success factors showed lower ratings for those specific factors. The list of those factors, based on the data over several years, but focusing on the 2011 MC, are:

1. Making sure students who attend MC are the appropriate target audience. This year that criterion was met to a large extent. Those students who had no previous experience made comments such as, "Too difficult if you haven't had physics yet."
2. The lectures have to be focused, relatively short, engaging with not so much text on each slide of the PowerPoint presentations. They also have to be interactive. When students are *not* involved, they report that the lecture is boring, too long, etc. Students like most when they can ask questions and are answered at their level of understanding.
3. Most students like the exercises. They like working with actual data and the "real-world" nature of the exercise. A few students who reported that the exercise is repetitive, appeared to not understand the nature of scientific research. Since this was 15% of respondents, maybe this is an issue that should be addressed.
4. Videoconferencing still has a long way to go to clear up the technical difficulties. The issues this year were mainly with sound. Other considerations are making sure students are prepared, making sure most, if not all, students get a chance to talk, and having a scientist as moderator who is enthusiastic and who addresses students questions, answering at their level of understanding. It was suggested in last year's report that there be a short discussion before the videoconference to discuss what questions students would be asking as well as having the mentor answer their questions before the conference.
5. Including tours helps students better understand particle physics research and how physicists do their work. This has implications for students wanting to go into physics careers and becoming more scientifically literate—two major goals of QuarkNet. Guides that are enthusiastic and address students' questions are reported as the most engaging.

Note on Preparation: The extent and kind of preparation is still not as clear as the other success factors for MC.

Key Findings

The following summarizes some of the key findings from the *Masterclass Questionnaire 2011* for teachers and students.

- The majority of students reported coming to MC with a sub group of their class on a voluntary basis (144 students; 45%); 21% with their whole class
- There was a 93% response rate, which means that the data represent masterclass
- 85% of students comprised the target audience—students taking physics
- 62% of respondents reported taking or haven taken advanced physics (IB, AP, Regents, Honors)
- 80% of respondents reported having some form of preparation for MC.
- Orientation, preparation and resources reportedly helped the teachers who used they and their students have a successful masterclass (teacher ratings 4.2 to 4.5 out of a possible ‘5’).
- Respondents reported learning significantly more through MC about key particle physics concepts and particle physics in general (all statistically significant at $< .001$).
- When asked what they liked *best*, 44% of student respondents indicated the exercise, 26% the lectures, and 15% each indicated video linkup and tour.
- Teachers rated the introduction, discussions, moderators, overall format, organization and tours from means of 4.1 to 4.4 out of a possible ‘5’ and the video link-up a mean of 3.3.
- When students were asked the extent to which they liked the masterclass they attended, the overall mean was 4.0 out of a possible ‘5’ and a standard deviation of only 0.9 means relative consistency among responses.
- After attending the MC the students reported being more interested in physics in general (the mode was ‘4’ out of a possible ‘5’ from 124 responses out of 320 possible)
- Opinions about MC in 2011, 2010, 2009 was similar with the exception of knowing more about particle physics after attending masterclass, which greatly increased by a mean of 1.7. This finding could be the result of reaching the target audience more this year than in the past, better preparation for students, and/or teacher orientation.
- Success factors were identified/corroborated (see section, above)

Conclusion

Masterclass is now a mature program with reasonably well-known effectiveness criteria. It has been shown to achieve many of its goals year after year, especially related to increased understanding of key content. However, the effectiveness of activities and resources in preparation for MC is still to be determined.