
# Experiences of MOOCs and 25 year short courses for industries

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## ABSTRACT

Recently, the impact of MOOCs(Massive Online Open Courses) is huge not only in terms of its number of registration but also its wide geographical, age, and educational background. This paper introduces the courses that are related with noise/acoustics in MOOCs: its current statistics. KAIST has been offering noise related short course for more than 25 years: one is for modal analysis and another is to introduce the fundamentals of acoustics. This paper attempts to compare the recent MOOCs courses related with noise/acoustics, and others, including the conventional offline short courses: pros and cons.

Keywords: MOOCs, short course, noise/acoustics I-INCE Classification of Subjects Number(s): 07

## 1. MOTIVES AND OBJECTIVES

From conventional lecture to MOOC (Massive Open Online Course), there are many means to learn about noise control related subjects. The subjects can be, general or fundamentals of acoustics, vibration, introduction to dynamics, or more advanced courses: modal analysis, noise control (passive or active), courses that handle relevant signal processing fundamentals, etc. Very recently, KAIST has an opportunity to launch, "Introduction to Acoustics," in one of MOOC, Coursera (1), which has 7.1 million users in 641 courses from 108 institutions as of April 2014. Surprisingly, acoustics has never been considered in Coursera. We also was not able to find any other noise control related courses in MOOC, except the one in MITedx: vibration course (2). It is, therefore, good opportunity to consider whether or not our society, including I-INCE or societies that handles noise and acoustics related subjects, would consider MOOC as a means to educate whom has interest in noise, vibration, acoustics, and related subjects. Conventional way to educate noise related subject is to offer "industrial course," or short courses for industry. There are many schools which serve industries by offering the short courses, including what has been offered by ISVR(Institute of Sound Vibration), Harrick Lab. Of Purdue Univ. Penn State Univ. has attempted to make a platform where academics, including graduate students, meet industry people, regularly during April every year. This is rather different form compared with a conventional short course for industry, but aims to propagating what university has been developing for nose related issues, and achieving good, practical outcomes. Therefore, it is our objective to put these two education practices as well as other means, including YouTube lecture, distance learning, and conventional class room lectures on the same table, whether or not whom has to take them, one or two, by looking at their properties at the same time. However, since MOOC is relatively new way of conveying the concept of acoustics, we put our experience on this means more heavily than others.

## 2. Our experiences on MOOC

The lecture slowly started in terms of number of registration, but eventually the number hits more than 10,000, registration: then it decays very rapidly to a steady 2000 visitors for about a month then drop to less than 1,000 viewers (Figure 1). Finally the number of students who completed the course, by having all the quizzes, reaches about 500. Figure 2 shows the distribution of the score. Students who obtain more than 60% received a statement of accomplishment.

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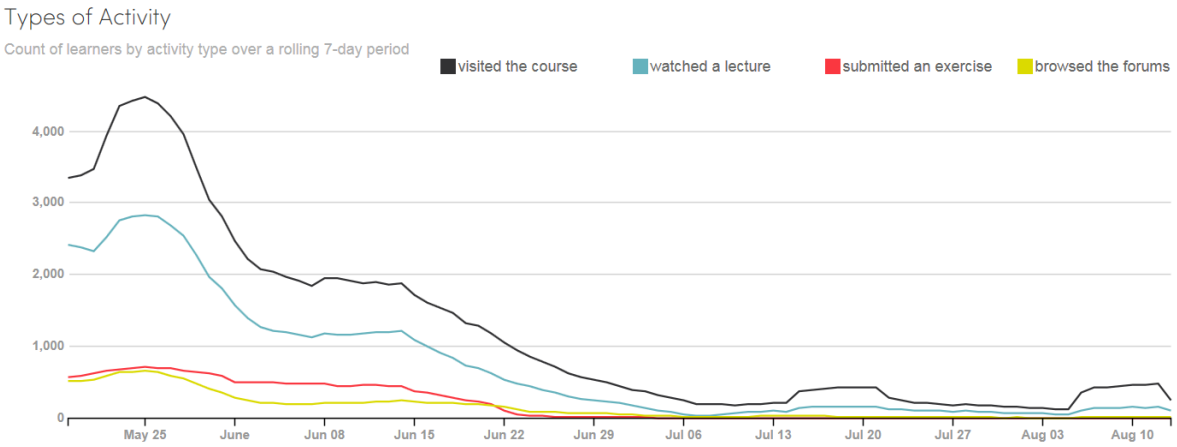


Figure 1 – Trend of lecture activity in Courera's "Introduction to Acoustics (Part 1)" - Count of learners by activity type over a rolling 7-day period (black: students who visited the course, blue: students who watched at least one lecture, red: students who solved and submitted a quiz, yellow: students who browsed the forums)

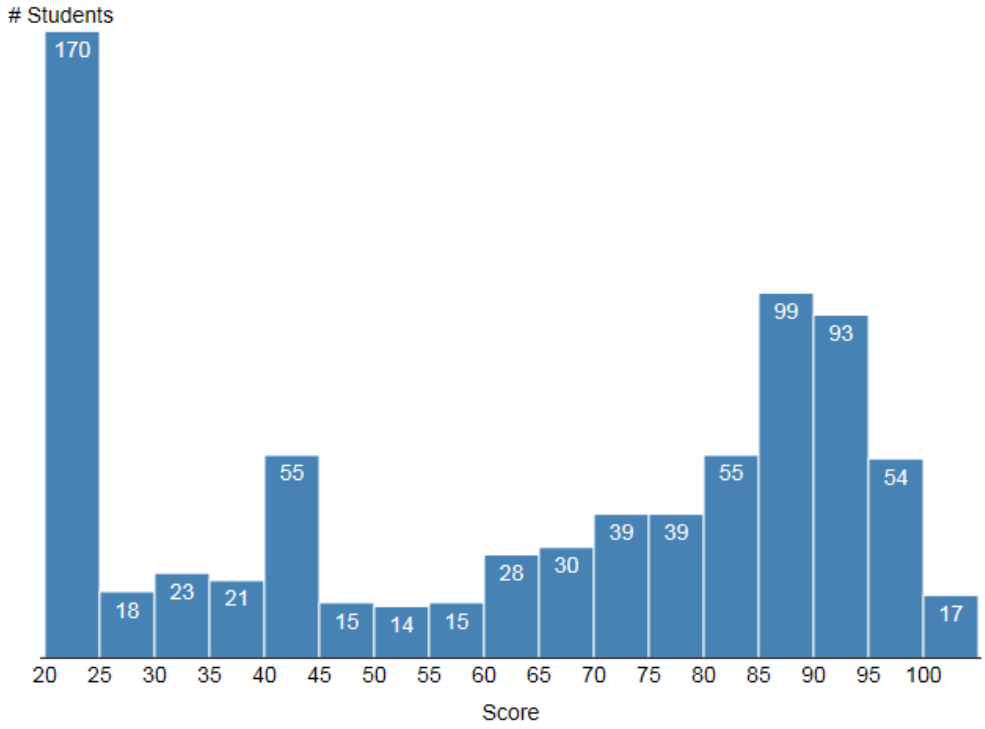


Figure 2 – Score distribution of Coursera's "Introduction to Acoustics (Part 1)" (Students who obtain less than 20% is not expressed.)

It is free course, meaning that no charge for the course. Therefore, in the beginning, we expected that many visitors were whom just had curiosity about acoustics. But as the lectures go, it became clear that the course needs some degree of math and university level physics, therefore, significant reduction of viewers. However, it is quite noticeable that there is considerably good size of participants in the forum, which allows students ask questions and volunteer provides answers. The size of forum was quite significant. We recognize that this type of course offering could be used to invite whom does not have a chance to learn about acoustics. The distribution of all registration is quite interesting also: 24% from U.S.A. next is from India, 8%, and Brazil, United Kingdom, Spain, and Mexico share about 4 to 3%. In terms of continent, 32% from north America and Europe, and 23% from Asia.

The course provides video lectures, which normally take about 20 min. to 30 min. The part 1 covers, string vibration and waves, one dimensional wave equation, specific impedance, the governing equation of string, driving point impedance, use of complex function, Euler equation, conservation of mass, state equation, intensity and energy, units of sound (dB scale, octave scale), solution of wave equation, normal impedance on a flat surface of discontinuity, the mass law, transmission loss of a partition, Snell's law, transmission and reflection of partition. It is 5 weeks course. The part 2, is again designed to be 5 weeks course, covers, radiation, scattering, diffraction, room acoustics, Sabine's theory, reverberation period, duct acoustics, Helmholtz resonator, by introducing the concept of acoustically small and large space.

The noticeable characteristics of MOOC courses are that it can give general idea about fundamentals of acoustics. There is also significant feed-back from students by using the forum, for example, Coursera case. The drawback, however, is that it is very expensive one in terms of a lecturer and teaching assistant.

On the other hand, other types of lectures, including a conventional class room lecture, obviously cannot beat MOOC in terms of number of students. Other than this massiveness, conventional offline classroom lectures are more beneficial to either student or lecturer. One example that provides opportunity to industry people who does not have a chance to learn about acoustics is "one week short course." KAIST, center for noise and vibration control (NOVIC) has been offering two courses for industry more than 25 years. The courses, of course, are not free. It has been reasonably charged, students have to come, physically, to KAIST, and stay for 4 nights, from Monday to Friday. These courses have been regarded as industry training courses by many industries: electronics, machinery, and environmental. In average, about 100 students enrolled for the courses, every year. This means that there are about 2500 graduates of these courses. These are, of course, very important elements that support our center in terms of industrial collaboration. The courses have been a contact points between academics and industries, often brought many significant industry research grants.

If we consider these various course: conventional lecture, MOOC course, YouTube course, remote lecturing, in terms of food recipes or foods itself, then it is obvious that no one can argue which one is the best. It entirely depends on who is going to take and what he/she wants to have. Table 1 compares the lectures.

Table 1 – Comparison of four types of lecture

| | YouTube | Remote Lecture | Education3.0 | MOOCs |
|---|---|---|---|---|
| Limitation of Space and Time | None | Real-time (limitation of time) | None | None |
| Target | Unspecified | Applicants | Applicants | Applicants (Unspecified) |
| Mutual Conversation | Only by comments | Real-time conversation | Off-line discussion | By on-line forums |
| Evaluation Process | Impossible | Same as off-line lectures | Mutual evaluation | On-line Evaluation |

Education 3.0 is a new model that has been practiced at KAIST for the recent two years. It consists two parts: one is video lecture, the other one is discussion session. The discussion session normally has maximum 6 members. Normally discussion session has 1 teaching assistant. Obviously, it is far more expensive one compared with the conventional lecture hall teaching. In the last semester, we ran "introduction to acoustics" course, which is almost same as the one we offered in MOOC. It is quite interesting that the students' achievement using education 3.0 is likely worse than what we have by Coursera. However, we cannot come up with the conclusion that MOOC is better than education 3.0.

## 3. CONCLUSIONS

It is obvious that no one can tell which means would be the best for everyone. It depends, of course, what student want to have from the course. However, teaching or, at least, conveying ideas of the fundamentals of acoustic using conventional short course, and MOOC, is not trivial. There are so

many derivatives, depending on students, time limitations, and surely motives are so vast in terms of individuals. We, therefore, reserve our conclusions on this matter, but suggest, now to talk about how we use MOOC for our subject of interests, noise, vibration, acoustics, related signal processing. Noise and acoustics have no home, but people, therefore government as well as media have interest on these subject, so as our societies. It is author's conclusion that we have to find the way to use MOOC for achieving our societies subjective: understanding and living with noise.

## REFERENCES

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