Coffee Chemistry, as Microlearning Content for Public Courses at Universities' Mooc System, A Preliminary Attempt

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Abstract: An attempt to have a scientific course for the public from higher education institutions was done by preparing a good set of contents for one particular topic of interest, which is also a science topic. Coffee chemistry is the topic chosen and some content was developed, including videos, audio-embedded social media, infographics and motion graphics packed with 8 topics. The choice of coffee amongst many sciences ' topic is considered strategic in bringing science to all audiences of society. Science content must explain nature as the object in holistic concepts, starting from smaller parts of each division, including chemistry. The microlearning approach is employed in the MOOC platform from The State University of Malang, Indonesia. This also is one of the three main tasks of higher education institutions which can be delivered in the MOOC system.

Keywords: coffee chemistry, MOOC, micro-learning, contents

INTRODUCTION

We cannot deny that the internet and information system in modern life has changed everything. This digital era is marked also using technology in the educational area. The fourth industrial revolution is being discussed during the last decade, and also accelerated by the use of information technology. In this book, Schwab had three goals to be reached by all. The first one is the awareness of the impacts of speed and comprehensiveness of the technological revolution. The second one is important, that the new framework of thinking by technological revolution claims some new core issues as well as impacts in the society. The third one is that more platforms are needed for cooperation and partnership with the public on issues related to the technological revolution. There are many possible activities from any part of society that can address the third aim of the book, regarding the use of technology as a common thing in life.

Education is also influenced by the fourth industrial revolution. Long before the digital revolution issue, Randy Garrison et.al. already discussed deeply blended learning in higher education in terms of community inquiry frameworks. Blended learning or more online learning influenced by the Covid-19 pandemic, becomes popular in a community of inquiry everywhere in educational institutions or outside. The role of the internet and communication technology extended the educational institutions' tasks to the user outside schools and universities. This is how the multi-users from the virtual world would play their role in shaping the education instructional designs. The extended instructional designs make the variety of courses increased in greater amounts and also multi-faceted. Good management in an educational institution is at the moment very crucial, both for bottom-up processes which include micro process and micro- learning content and also for top-down approaches to support new ideas in blended learning solutions.

On the other hand, disruptive learning also becomes a new character in modern education. In this digital era, the innovator's DNA is the key to success in life in the future. Microlearning and disruptive learning, when applied in educational activities can be analogous to running DNA which is innovative in curriculum and instructional designs. A lot of variation can be the new face of education, speedy and popular. In this case, the conventional curriculum and approaches in the teaching and learning model would face tough challenges.

Using Micro-Learning in education can be a strategy for providing innovative processes for society too–[10]. An academist should know how to teach better, to know better about the audience as well as arrange the learning object materials according to the aims of the course. All the curriculum content can be made available as micro-content, for microlearning processes. In this case, microlearning can become a new trend in future education, especially in the digital era.

On the other hand, massive open online courses (MOOC) are also popular in education in this decade. MOOC is open to the public so that it can be a community service for society. As one of three main tasks in higher education, community service comes together with education, as well as research and science development. Not only courses for internal use in universities, but also public and private communities can be made possible via MOOC. MOOC can be a unit for learning for all and can be made massive for all too. In higher education, MOOCs can be made a platform for the university to give their service to society.

Chemistry education is a difficult but important subject in the curriculum. Chemistry deals with all materials on earth from the smallest part of them. Chemistry is science from an atomic and molecular level, something that is far from daily life. But chemistry deals with all materials and biomaterials related to human life. Chemistry education, therefore, is important to explain more about materials scientifically. Chemistry education also plays role in balancing nature eventually by maintaining equilibrium chemistry. Chemistry and chemistry education are inseparable, having all materials and all conditions must be explained scientifically.

Chemistry education deals with daily life as well, for example in understanding coffee drinks, which are popular with the younger generation. As a part of the culture, coffee can be the centre of attention in daily life, more in social life–[16]. Coffee chemistry is an approach to seeing and investigating the drink from a chemistry point of view. There are more chemical compounds present in coffee to bring the taste and aroma of coffee that one can perceive. Chemistry can be the key to the making of certain variations in coffee servings. This topic is also suitable for some vocational schools that deal with coffee.

Coffee chemistry in MOOC makes the higher chemistry concepts can reach society, depending on how it is delivered. As a microlearning content coffee chemistry is an interesting object in the future, bringing knowledge benefits to participants who can be from any profession in society. Some baristas, coffee businesspeople, roasteries, herbal medicine producers, or others who like and enjoy coffee can be a participant in this course. Therefore, the coffee chemistry course is developed, to contribute to science awareness for daily life activities. This course is open to the public and put in the MOOC system at The State University of Malang at mooc.um.ac.id.

METHODOLOGY

The research and development of the course used is the ADDIE design (Analysis, Design, Development, Implementation, and Evaluation) which is generally used to develop the topics in the module. The micro-learning modules that will be made starting from the analysis stage, both the need for chemistry to explain coffee and every step of the coffee- making process. There is also a search for public interest in the topic of coffee related to chemistry, the needs of course participants or the public as well as the availability of topics to be used as problems. The main target respondents might be café owners, coffee lovers, coffee roasting business, social media content makers, and many others.

After the analysis is done, the module will be designed and developed by referring to other relevant sources, such as textbooks, photographs on the internet, as well as trusted online sources. This module is implemented in classes that have been designed through the MOOC UM platform. The evaluation stages will be carried out at any time. The design diagram can be seen in the following figure:

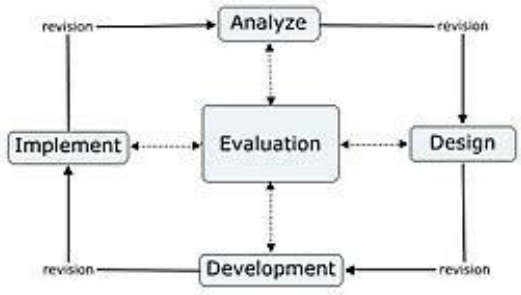

Figure 1. ADDIE development design of a MOOC class

Each meeting will be equipped with various Learning Object Materials (LOM) as shown in table 1 and equipped with a portfolio table which will be evaluated from time to time. On several occasions, it will use a Problem Based Learning approach that starts from

realproblems that occur in events in the coffee world and is accompanied by PBL syntax whichis often used in chemistry learning.

The Problem Based Learning method is very interesting because it combines theory and real learning. Each module will apply the steps of problem-understanding, curriculum exploration and problem-solving. Examples can be drawn from the experience of course participants and this is a reality that benefits learning for others. The validation stage is also an important stage that needs special attention. Validators in the IT field will help provide valuable input and be a good comparison with what is expected by society in general. Besides that, there was also content validation from a chemistry point of view. Course content is the center of attention so content validation is the main emphasis this time. Further implementation would also deal with effectivity and impact of the course on society.

RESULTS

The respondents would be interested in coffee components and coffee processing. The discussion around coffee chemistry would expand to several general interest such as coffee's flavor development, public's favorites flavor, social media about coffee, start up about coffee, and many other. Coffee philosophy is also popular now since people like anything new about themselves.

An instructional design has been made for the coffee course, with certain learning outcomes defined according to the ADDIE design. There were 8 times of meetings for both synchronous and asynchronous which were aided by some learning object materials. The content development was done for 8 topics of coffee as a popular drink from a chemistry point of view. The implementation was described in the lesson plan for the course. Chemistry education must discuss chemistry in contextual life, as in coffee chemistry, discussing chemistry around coffee, chemical changes during roasting and brewing, and the resulting coffee flavors from the public. All materials were packed as microlearning content, as a strategy to deliver knowledge to the public. The language wasmade popular too to avoid boredom from the participant's side.

The whole course is made with contextualization. A full lesson plan was developed to assist the learning process when the course is launched. The team evaluated every step of the development as suggested by ADDIE design except the implementation. The reported activity was about developing content and the process and analysis of the contentrelated to the previous scientific research.

Various types of learning object materials will be used to make the content of this coffee chemistry course attractive to the public. The videos and motion graphics that are createdare the mainstays of the LOM that will be used in this course. The LOM that will be usedare presented in Table 1, all were placed in mooc.um.ac.id.

Table 1. Outline of the course

Topics	LOM
Introduction: how coffee chemistry is relevant	Handout, PowerPoint presentation, video 1
Chemistry of coffee	Handout, PowerPoint presentation, Infographic 1
Healthy coffee	Handout, PowerPoint presentation, Infographic 2, Motographic
Coffee brewing	Handout, PowerPoint presentation, Video 2, Motographic 2
Coffee cupping and serving	Handout, PowerPoint presentation, Video 3, Infographic 3
Coffee of freedom	Handout, PowerPoint presentation, Video 4
Philosophy coffee	Handout, PowerPoint presentation, Infographic 4
Feedback	Handout, PowerPoint presentation, Ppt, Infographic 5

The course is open to the public who are interested in scientific coffee. This is also a trialto make chemistry more human. The MOOC courses are one of the attempts of contextualizing chemistry in life, for example for the coffee courses. This type of public course is also a STEM education course that is of interest to many educational scientists

[4] serving the queries of learning communities. There are more possibilities formedin the future by the same designs. This course is oriented to vocational study and the knowledge contained in this course must prepare students and participants to have theircareers in the area.

All of the content provided must be validated using relevant assessment tools. This is theongoing process at the moment and the further analysis would be presented together withimplementation results. Assessment tools is also subject to review and validation by the experts and users. All instructional designs as well has to pass the need from the society.More assessment and also microlearning contents are to be developed related to this course.

The Instructional design for the course yields some learning outcomes for the participants. Most of them are giving chemistry knowledge and reflections on a coffee drink. Some extent to herbal medicine due to some relevant natural compounds present in the coffee extract. Some explanation suggests that one can design the coffee flavours from the roasting and brewing processes. There are chemical changes during the roastingprocess,

in which the heat would break down some bigger compounds into different typesof compounds. All data used in this course came from research at the chemistry laboratory and some of them published already. Coffee's flavour as well as enhancing the presence of good components are the aims of each process.

Humanizing chemistry education is a well-discussed topic about chemistry teaching that has to reach humanity. Different humanistic approaches in chemistry teaching musthave a socio-scientific orientation and this includes problematic issues as well. By makingsimple chemistry courses in public courses of universities, chemistry can be closed to thepublic from daily life objects. The variations that come from chemistry learning can be limitless in possibilities. Obvious to expect is the coffee business thing that can use the chemistry components to start with. This is only one example.

At last, all education processes must be ecological, logical and fair to nature. The implications of chemistry and science education must be considered and assessed from the beginning. As chemistry as a science is responsible for big man-made changes in nature, all levels of education should consider ethics too. All processes in chemistry must be balanced to avoid over-exploitation of our nature causing worse impacts in the future.

CONCLUSION

One set of contents in a public course in university MOOC was developed. Eight topics related to coffee and chemistry were developed and stored in MOOC platform of The StateUniversity of Malang, ready to be launched. The course is designed for people who are interested in coffee and want some additional knowledge about coffee from a chemistry point of view. The implementation of the course can be varied in all sectors including business. This is how chemistry education should be prepared for contextualization.

On the other hand, MOOC is a very useful tool for the university to run the three main tasks of higher education institutions (Tridarma perguruan tinggi) inclusively together. The education part, research and development, and civil service for the society. Within the scope, the use of information technology is very important and needed in this digital era. Microlearning contents are also a necessity at this time since the strategy can be a technique in instructional designs to gain more knowledge for a longer time.

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