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Research Article

Infection control as a subject in the secondary level of education: A theoretical outcomes-based course outline

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The 2020 pandemic outbreak made health organizations and governments around the world to implement health measures that significantly affected education. The impact of COVID-19 on education shows that educational institutions are not ready for a pandemic circumstance. Educational institutions were closed to prevent the rapid transmission of infection. The members of the community relied on lectures regarding infection control given by health educational institutions through distance learning. The affected communities heavily relied on expert's advice regarding infection control. Implementing a basic course regarding infection control at the secondary level may give us a different situation. This article proposes a theoretical course outline regarding infection control as a discipline. Preparedness in a pandemic outbreak can be reflected from the presented contents, activities, and learning outcomes of the proposed theoretical course outline. This article analyzes the rationale on why infection control should be a subject in the secondary level of education. A qualitative descriptive research design has been utilized in reviewing related articles for this conceptual study. The article also aims to show a theoretical course outline that may be used to guide the educational institution in implementing infection control as a discipline.

Keywords: COVID-19; Infection control; Secondary level of education; High school; Outcomes-based

I. Introduction

The impact of the 2020 pandemic outbreak of Coronavirus 2019 (COVID-19) on education is significant (Spinelli & Pellino, 2020; Heymann & Shindo, 2020). It showed how the educational system adversely affected students when a pandemic occurs. It also shows how the system lack concepts that may have prepared students or members of the community to implement preventive health measures during a pandemic (Sintema, 2020). Epidemiologic health measures restricted movements and events in affected countries. The implementation of health measures resulted in the closure of business, religious, and educational institutions. Some educational institution terminated operations to prevent the transmission of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (Heymann & Shindo, 2020; Anderson et al., 2020) . SARS-CoV-2 is the virus that caused the disease COVID-19 (Gorbalenya et al., 2020; World Health Organization, 2020A). Epidemiological surveillance for patients with presumed carriers of SARS-CoV-2 was strictly enforced. Public gatherings like educational seminars, workshops, or training were canceled (World Health Organization, 2020B; Kucharski et al., 2020; Center for Disease Control and Prevention, 2020A). Major health organizations like the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) published health measures that help prevent transmission of the SARS-CoV-2 (World Health Organization, 2020A; Center for Disease Control and Prevention, 2020B; World Health Organization, 2020C). They also recommended health policies that help control and isolate members of the community to help reduce the transmission of SARS-CoV-2. These health policies have a significant impact on education because it enhanced the rationale to close educational institutions. Some educational institutions implemented distance education to continue operations for their students (Zhou et al., 2020; Usak et al., 2020).

Distant education became promising but led to problems concerned with connectivity. Some students in affected countries lack internet connectivity, especially in developing countries (Guri-Rosenblit, 2013). The lack of resources prohibited educational institutions in using distance education. The shift of education medium to provide quality education is drastic and chaotic if a present curriculum is being implemented in an active academic or school year. The shift may lead to problems that may invalidate the learning outcomes of the students. The measures are arguably unfavorable, but application throughout affected countries is present

(Basilaia & Kvavadze, 2020; Daniel, 2020). The events occurred because of the pandemic outbreak that was classified by the WHO (World Health Organization, 2020A). As the confirmed cases and death count increases, many health education institutions provided online lectures regarding preventive measures for COVID-19. Some of these lectures included knowledge regarding SARS-CoV-2 transmission, basic handwashing, face mask usage, environmental disinfection and sanitation, and safety health policies implemented inside the community. The rise of the online lectures shows that the knowledge of members of the community regarding infection control is prioritized by health education institutions. The information regarding COVID-19 is still limited, but infection control has been studied in the past by many researchers (Miller et al., 2005). Various major health organizations implemented standard guidelines regarding infection control that made an impact on the study of infection control (World Health Organization, 2020C; Center for Disease Control and Prevention, 2020B; World Health Organization, 2020D). The concept of "infection control" is not new in the field of medicine and various allied health disciplines, but it may be new to non-medical personnel. Health education is present in secondary and tertiary education, but "infection control" as a discipline is only being taught in health-related tertiary education institutions (Mann & Wood, 2006; Ojulong et al., 2013). Students that enter the secondary level of education will have basic knowledge regarding health (Begoray et al., 2009; Brown et al., 2007), but they may not be familiar with infection control. Their knowledge can be supplemented if "infection control" is taught immediately after learning basic health education. Students will know health-related measures to control infectious pathogens. They will have an idea of the prevention of transmission of infection when the circumstance requires it. Circumstances may include epidemic, endemic, and pandemic outbreaks. The 2020 pandemic of COVID-19 teaches us that early knowledge of infection control can give us a step ahead in preventing transmission of SARS-CoV-2. Individuals with knowledge regarding infection control may have a higher chance of surviving the pandemic outbreaks (Dewalt et al., 2004). The preventive method also reduces the fatality rate in terms of epidemiologic context and makes the community prepared in a viral pandemic outbreak. The practical adaptivity of this article came from the occurrence of a pandemic outbreak. Members of the communities must adopt new approaches in education that will make them ready in pandemic outbreaks.

1.1. Infection Control

Infection control is a discipline that is concerned with the prevention of harm caused by infectious pathogens (World Health Organization, 2020E). Infectious pathogens include bacteria, viruses, protozoa, fungi, and worms. The prevention of infectious pathogens deals with maintaining a set of rules that eventually keeps every individual inside the community healthy. The study of infection control, an essential part of the field of health care, maintains a series of methods that indirectly contribute to the quality of life. The methods or processes enables health care providers to protect everyone from diseases related to infection (Burke, 2003). The topics found in infection control are also medically-related. The surrounding medical-related field, like epidemiology and infectious disease, are inclined in the topics presented in infection control. Epidemiology presents information about the factors, incidence, distribution, and possible control of diseases in a community. Infection control may include topics in epidemiology because it is related to the prevention of diseases (Sydnor & Perl, 2011). Infectious diseases present information about the disorders that may lead if an infectious pathogen successfully afflicted an individual. Infection control is relevant in providing safety measures that are needed to avoid pandemic outbreaks (Gersovitz & Hammer, 2004). The discipline is widely practiced in the health care setting. Facilities like hospitals and medical clinics often focused on improving infection control protocols. Training is mostly found in the tertiary level of education. Almost all the health-related courses at the tertiary level are familiar with infection control. Formal training in infection control makes health care providers the sole experts in the field. Standards regarding infection control, as a preventive approach, are currently present in a major health organization. Guidelines that serve as a standard are often updated with current researchers. This standard serves as the recommendation in handling preventive health measures to stop the occurrence of infection. Infection control basic information are available through health organizations website like the Centers for Disease Control and Prevention (CDC) (Center for Disease Control and Prevention, 2020B). The website contains basic knowledge that can help non-medical personnel prevent diseases. There is no assessment on the websites found online. Anyone can read the basic information on the internet, but there is no guarantee that they have acquired mastery of methods to prevent infection.

Infection control, as a discipline, is attached to actionable policies. The result of infection control will always be based on a criterion that sufficiently prevents infection (Smith & Rusnak, 1997). Aside from the philosophies surrounding infection control, policies that dictate how methods are approach will be one of the operational core of the discipline.

2. Materials and Methods

This conceptual article used a qualitative descriptive approach of research methodology. The article analyzes the content, activities, and learning outcomes of an infection control theoretical course outline. The article assesses the pandemic outbreak as a rationale in the formation of an infection control theoretical course outline. The analysis will help the show the rationale on why infection control should be a subject in the secondary level of education. The related studies about infection control in the field of health care is used as a source of reference for the formation of the course outline. The organization of the curriculum is based on policies published by major health organizations. The formation of a generalized curricular structure aims to provide educational institutions a framework that can be used as a guide in the implementation of an infection control curriculum.

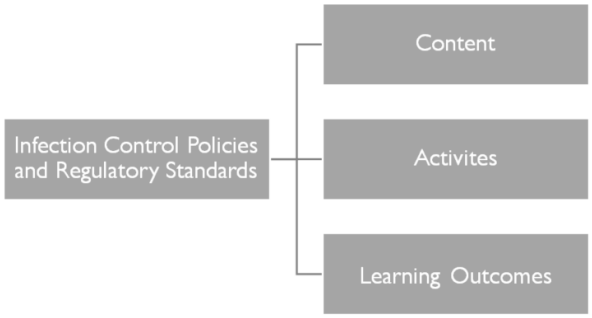

Figure 1. Schematic diagram of the review of related articles

Figure 1 shows components of the review of related articles of this conceptual article. The infection control policies and regulatory standards have been made the primary reference for the fabrication and analysis of the elements of a theoretical outcomes-based course outline. The policies from the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have been selected as a primary reference for infection control policies. The derived components have been subjected to the analysis that has shown the rationale in implementing the course outline.

3. Results and Discussion

Like some curriculum in the tertiary level of education, the infection control course must be implemented as subject-centered. Subject-centered curriculums tend to be bookish in terms of standards and ideals (Manning & Bucher, 2012). This must be in the case of infection control, where standards should be followed. Infection control in the secondary level of education must be based on a clear framework that will teach the students to understand the importance of quality control. Quality standards in infection control are important because it shows how effective the methods of infection control. This theoretical curriculum also suggests how it should be taught. A clear guideline on the content, activities, and learning outcomes should be stated if it is subject-centered. The following parts of the course outline include content, activities, and learning outcomes.

3.1. Content

The following content regarding infection control is generalized based on current studies. Specific content must be reviewed by the educational institution that will implement an infection control curriculum. Content of the infection control curriculum is focused on (a) the principles of disinfection, sterilization, and sanitation, (b) transmission mechanism of the infectious pathogens, and (c) methods aimed towards the prevention of infection.

The principle of disinfection, sterilization, and sanitation is a topic that aims to give learners fundamental ideas regarding infection control. These ideas will help them value policies, standards, or objectives that will help them succeed in the prevention of infection. The major topic included in this unit includes the definition and conceptualization of the terms disinfection, sterilization, and sanitation. Factors that affect the efficacy of these terms will supplement the major topic. Historical events or proponents related to these terms may be included to give learners the background of development regarding infection control.

The description of how the infectious agents transmit is appropriately considered in this curriculum. It will explain the mechanism of transmission mediums that causes infection. Factors regarding the transmission will supplement the context of transmission. Students will learn how to modify these factors if they are presented clearly. The reservoir or carrier of infectious pathogens may also be included to supplement prerequisite studies on biology and microbiology. Major topics may include direct transmission, indirect transmission, common vehicle, animal transmission, and vector transmission. Direct transmission may include sexual transmission, blood transmission, skin transmission, and mother to child transmission. Indirect transmission may include material object transmission and airborne transmission. Common vehicles may include ingested transmission and biological product transmission. Animal transmission may include animal bites and direct transmission from animals. Vector transmission may include insect transmission. The transmission topics will help the learner gain basic knowledge regarding the spread of infection. The modes of transmission will always have methods to prevent, so this is important in the study of infection control.

Methods, techniques, or procedures regarding hygiene, disinfection, and sanitation must be included in the curriculum. The rationale for why the students need to learn specific efficient methods should also be included to provide the learner procedures that have quality control. Topics regarding the control of transmission routes should be included. Hand hygiene, usage of personal protective equipment (PPE), and environmental disinfection or sanitation are the major topics related to the control of transmission routes. Hand hygiene will include the description of handwashing techniques, factors that will affect handwashing, and cross-contamination regarding hand hygiene. The usage of PPE will contain the description of the parts of PPE, selection of appropriate gears, and proper disposal of PPE. Environmental disinfection or sanitation will include a description of disinfectants, proper disinfection techniques, sterilization of utensils or care equipment, and waste disposal. This topic will give the learner applicable practical ways to fulfill objectives geared towards the prevention of infection.

3.2. Activities

The activities related to infection control should also be strictly reviewed by the educational institution. Activities that apply to infectious pathogens may harm learners if supervisors are not strictly enforcing rules regarding safety procedures. Activities should also be cost-efficient, so the education institution will not be financially constrained on the matter. Teacher-centered discussions, where the teacher is the center of learning, are appropriate in subject-centered curriculum design. The teacher will serve as the master of the subject matter. Students must adhere to the standard given by the teacher to facilitate the quality of standard regarding infection control. The demonstration is also recommended for methods that are technique specific. Infection control activities may require careful supervision to maximize learning. The bulk of activities should be focused on discussions and demonstrations. Some activities for the demonstration may include hand washing, PPE usage, and disinfection of environmental surfaces. Mastery learning will help the teachers evaluate each level of learning. An example of a mastery learning application is the mastery of handwashing, where students learn a step-by-step technique facilitated by the teacher. Oral reports may also be supplemental to facilitate self-directed learning. Role-playing may also be supplemental to encourage students to become health care providers or experts in infection control. The educational institution should also consider the guidelines published by major health organizations like the WHO for infection control. The consideration of these guidelines may help increase the quality of infection control done by the learners.

3.3. Learning outcomes

Learning outcomes are subjected to review by the educational institution. Each learning outcome should be aligned with the content that is provided with activities to produce learning. The following learning outcomes are generalized for guidance in modifying the infection control curriculum. The following learning outcomes are suggested for the content suggested previously (a) the principles of disinfection, sterilization, and sanitation, (b) transmission mechanism of the infectious pathogens, and (c) methods aimed towards the prevention of infection.

The learning outcomes included for the principles of disinfection, sterilization, and sanitation include the understanding of the philosophies that conceptualize disinfection, sterilization, and sanitation. Students who understand the philosophies surrounding the mentioned terms will help students value, appreciate, and analyze the ideas or knowledge regarding infection control. Students will have a foundational background that will help them prevent infection. The learning outcomes included for the transmission mechanism of the infectious pathogens include the analysis of the infection process that is important in the application of preventive measures. Students will know how to assess the different circumstances of infection. This will help them modify their management for infection control. Students who know how to modify their management for infection is healthy for the community. The learning outcomes included for methods aimed towards the prevention of infection is the application of processes that will help in the prevention of infection. Application is the form of procedure implemented by the learner to implement infection prevention. They are action requirements being implemented by health-oriented individuals. These applications are the core maneuver of health professionals for infection control. Students who apply methods within the quality standard will help control and monitor infection when the circumstance requires it.

3.4. Prerequisites

Students at the secondary level of education must have learned the basic knowledge in human biology, microbiology, and health education. The correlation of these disciplines may be integrated into a broad field subject that is composed of compounded lessons regarding health education. The importance of these prerequisites gives the student a foundation of knowledge regarding infection control. This will give the learner an easier learning process because infection control is a discipline that is related to many health subjects (Lee, 2008).

4. Challenges in the Implementation of the Program

The challenges in the implementation of an infection control program for the institution include resource allocation, faculty personnel, facility-related problems, waste disposal, and committee-related problems (Talaat et al., 2006; Soule & Memish, 2001). Resource allocation involves transferring of resources for the benefit of the program. The allocation entails sacrificing other development projects of the institution. Faculty personnel is always a challenge that every institution handles. The infection control discipline requires training from a health educational institution. The training will give faculty members sufficient knowledge in infection control. The hiring of faculty members, who are specializing in health, may also pose a challenge. Professionals, who are in the field of healthcare, often have full-time work. Faculty hiring from health is difficult because almost all countries enact professional examinations in education. If healthcare professionals would like to teach at the secondary level, then they must study education-related courses and take a professional examination. Facility-related problems include planning for rooms that will accommodate equipment or areas for practical activities. Large equipment may not be necessarily be involved, but areas for the sink may be included. The location of the facility may also be considered. Emergencies may happen to students during activities. The location near the school's clinic will be favorable for emergency-related concerns. Waste disposal involves a proper sanitation routine for the school. Proper sanitation may involve specialized waste disposal management. Institutions that will look for a waste disposal company, that specializes in infection control, maybe a challenge. The equipment-related problem for waste disposal may also pose a challenge. Committee-related problems may involve policy-making and curriculum implementation.

5. Conclusion

Pandemic outbreaks teach us lessons that we may take for granted. One of the lessons is infection preparedness. Infection control is a discipline that may help students prepare for a pandemic outbreak. The discipline requires students to be health-inclined to control infection. The secondary level of education has prerequisite subjects that may appropriately help implement an infection control discipline. The implementation of the infection control subject in the secondary level of education includes the fabrication of a subject-centered course outline. The course outline must include contents that are related to the foundational theories regarding infection control. The course outline must also include activities that are practically applicable to the prevention of harm. The course outline must also be aimed at producing outcomes that will help students in preparation for infection outbreaks. The limitation of this study includes the absence of implementing an actual infection control course for the secondary level of education. The evaluation of an actual implementation of the course may have shown the empirical data that will present the preparedness of students at the secondary level. The infection control discipline has always been applied in health care settings to prevent infection. Considerable prevention was always made in health care settings. The students in the secondary level of education may relatively apply considerable prevention of infection in their circumstances. The infection control discipline will help students form basic knowledge that can save lives.

Conflict of Interest

The authors declare no conflict of interest.

References

Anderson, R.M., Heesterbeek, H., Klinkenberg, D., & Hollingsworth, T. (2020). COVID-19: what is next for public health?. *The Lancet, 395*(10224), 542-545. https://doi.org/10.1016/S0140-6736(20)30567-5

Basilaia, G., Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. *Pedagogical Research, 5*(4). https://doi.org/10.29333/pr/7937

Begoray, D.L., Wharf-Higgins, J., & Macdonald, M. (2009). High school health curriculum and health literacy: Canadian student voices. *Global Health Promotion, 16*(4). https://doi.org/10.1177/1757975909348101

Brown, S.L., Teufel, J.A., & Birch, D.A. Early adolescents perceptions of health and health literacy. *Journal of School Health, 77*(1), 7-15. https://doi.org/10.1111/j.1746-1561.2007.00156.x

Burke, J.P. (2003). Infection control - a problem for patient safety. *The New England Journal of Medicine, 348*(7), 651-6. https://doi.org/10.1056/NEJMhpr020557

Centers for Disease Control and Prevention. (2020A). COVID-19 Travel Recommendations by Country. https://www.cdc.gov/coronavirus/2019-ncov/travelers/map-and-travel-notices.html#travel-1

Centers for Disease Control and Prevention. (2020B). Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html

Daniel, J. (2020). Education and the COVID-19 pandemic. *Prospects*. https://doi.org/10.1007/s11125-020-09464-3

Dewalt, D.A., Berkman, N.D., Sheridan, S., Lohr, K.N., & Pignone, M.P. (2004). Literacy and health outcomes: a systematic review of the literature. *Journal of General Internal Medicine, 19*(12), 1228-39. https://doi.org/10.1111/j.1525-1497.2004.40153.x

Gersovitz, M., & Hammer, J.S. (2004). The Economical Control of Infectious Diseases. *The Economic Journal, 114*(492), 1-27. https://doi.org/10.1046/j.0013-0133.2003.0174.x

Gorbalenya, A.E., Baker, S.C., Baric, R.S, de Groot R.J., Drosten, C., Gulyaeva, A.A., Haagmans, B.L., Lauber, C., Leontovich, A.M., Neuman, B.W., Penzar, D., Perlman, S., Poon, L., Samborskiy, D.V., Sidorov, I.A., Sola, I., & Ziebuhr, J. (2020). The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nature Microbiology, 5*(4), 536-544. https://doi.org/10.1038/s41564-020-0695-z

Guri-Rosenblit, S. (2013). Challenges facing distance education in the 21st century: Policyand research ımplications. In U. Bernath, A. Szucz, A. Tait, & M. Vidal (Eds.) *Distance and E-Learning in Transition*. (pp. 1-22). John Wiley & Sons, Inc. http://dx.doi.org/10.1002/9781118557686.ch1

Heymann, D.L., & Shindo, N. (2020). COVID-19: what is next for public health?. *The Lancet, 395*(10224), 542-545. https://doi.org/10.1016/S0140-6736(20)30374-3

Kucharski, A.J., Russell, T.W., Diamond, C., Liu, Y., Edmunds, J., & Funk, S. (2020). Early dynamics of transmission and control of COVID-19: a mathematical modelling study. *The Lancet Infectious Diseases*. https://doi.org/10.1016/S1473-3099(20)30144-4

Lee, J.M. (2008) Articulation of Undergraduate and Graduate Education in Public Health. *Public Health Reports, 123*, 12-17. https://doi.org/10.1177/00333549081230S203

Mann, C.M., & Wood, A. (2006). How much do medical students know about infection control?. *Journal of Hospital Infection, 64*(4), 366-70. https://doi.org/10.1016/j.jhin.2006.06.030

Manning, M.L., & Bucher, K.T. (2000). Issues in Education: Middle Schools Should Be Both Learner-Centered and Subject-Centered. *Journal of Childhood Education, 77*(1). https://doi.org/10.1080/00094056.2000.10522138

Miller, J.T., Rahimi, S.Y., & Lee, M. (2005). History of infection control and its contributions to the development and success of brain tumor operations. *Neurosurgical Focus, 18*(4). https://doi.org/10.3171/foc.2005.18.4.5

Ojulong, J., Mitonga, K.H., & Iipinge, S.N. (2013). Knowledge and attitudes of infection prevention and control among health sciences students at University of Namibia. *African Health Sciences, 13*(4). https://doi.org/10.4314/ahs.v13i4.30

Sintema, E.J. (2020). Effect of COVID-19 on the Performance of Grade 12 Students: Implications for STEM Education. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(7). https://doi.org/10.29333/ejmste/7893

Smith, P.W., & Rusnak, P.G. (1997). Infection prevention and control in the long-term-care facility. SHEA Long-Term-Care Committee and APIC Guidelines Committee. *Infection Control & Hospital Epidemiology, 18*(12), 831-49

Soule, B., Memish, Z. (2001). Infection control practice: global preparedness for future challenges. *Journal of Chemotherapy, 1*, 45-49. https://doi.org/10.1080/1120009x.2001.11782328

Spinelli, A., & Pellino, G. (2020). COVID-19 pandemic: perspectives on an unfolding crisis. *British Journal of Surgery*. https://doi.org/10.1002/bjs.11627

Sydnor, E.R., & Perl, T.M. (2011). Hospital epidemiology and infection control in acute-care settings. *Clinical Microbiology Reviews, 24*(1), 141-73. https://doi.org/10.1128/CMR.00027-10

Talaat, M., Kandeel, A., Rasslan, O., Hajjeh, R., Hallaj, Z., El-Sayed, N., & Mahoney, F.J. (2006). Evolution of infection control in Egypt: achievements and challenges. *American Journal of Infection Control, 34*(4), 193-200. https://doi.org/10.1016/j.ajic.2005.05.028

Usak, M., Masalimova, A.R., Cherdymova, E.I., & Shaidullina, A.R. (2020). New Playmaker in Science Education: COVID-19. *Journal of Baltic Science Education, 19*(2), 180-185. http://dx.doi.org/10.33225/jbse/20.19.180

World Health Organization. (2020A). WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 March 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

World Health Organization. (2020B). Updated WHO recommendations for international traffic in relation to COVID-19 outbreak. https://www.who.int/news-room/articles-detail/updated-who-recommendations-for-international-traffic-in-relation-to-covid-19-outbreak

World Health Organization. (2020C). Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected. https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125

World Health Organization. (2020D). Infection prevention and control of epidemic-and pandemic-prone acute respiratory diseases in health care https://apps.who.int/iris/bitstream/handle/10665/112656/9789241507134_eng.pdf?sequence=1

World Health Organization. (2020E). Infection prevention and control. https://www.who.int/infection-prevention/about/ipc/en/

Zhou, L., Wu, S., Zhou, M., Li, & Fangmei. (2020). 'School's Out, But Class' On', The Largest Online Education in the World Today: Taking China's Practical Exploration During The COVID-19 Epidemic Prevention and Control As an Example. *Best Evidence of Chinese Education, 4*(2), 501-519. http://dx.doi.org/10.2139/ssrn.3555520