



## THE CLINI-CO-VID-EO-2020- LEARNING CONCEPT IN DENTAL EDUCATION

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**Abstract:** The introduction of digital technology has significantly changed most areas of human work. Advocates of technology in education have predicted parallel changes in the future of teaching and learning. Dental education is undergoing changes to help it face a competitive future. Considering the present COVID-19 pandemic going on, there is a huge loss for the undergraduate students all over on the academic front especially on the clinical/practical skill training aspect. This demands the universities to be technologically and architecturally well-equipped with skill lab facilities and also the expertise to be trained for the same. This article elaborates the essentials of adopting the e-learning system using the concept initiated by DMIMS(DU) and is being practised for online teaching of undergraduate students. The article also describes the duties, roles and responsibilities of each component involved in the Workflow of the system. Various other modalities and systems are also described. Evidence based literature on the efficacy of these systems is being focussed pertaining primarily on dental education.

**Keywords:** Dental education, e-learning, preclinical demonstrations, LMS

**Introduction:** The advent of the Internet has brought about a change in how we see the world. The introduction of digital technology has significantly changed most areas of

human work. Advocates of technology in education have predicted parallel changes in the future of teaching and learning. Dental education is undergoing changes to help it face a competitive future.<sup>1</sup> There is also evidence of constant innovation and changing approaches to electronic teaching and learning in dental education. A major part of that change has been brought by the widespread introduction and use of virtual learning environments – VLEs.<sup>2</sup>

**Origin of Online Teaching:** The modern concept of e-learning, and even the term itself, is not much more than a decade old. According to the etymology in Webster's American English dictionary, the term first appeared in the year 1997. It started at a time when people were adding e as a prefix to many common words, including e-mail, e-business and e-commerce. Since then, the term was very rapidly adopted, and became common currency all over the world by the turn of the century.<sup>3</sup> Nonetheless, it was not in general use in education until 2002; other terms were used as being synonymous with e-learning. However, e-learning is increasingly becoming an umbrella term.<sup>4</sup>

**It's Need and Relevance:** Considering the present COVID-19 pandemic going on, there is a huge loss for the undergraduate students all over on the academic front especially on the clinical/practical skill training aspect. The inability of the chalk and talk didactic



sessions, discussions, training amongst the student-teacher learning modality has faced a huge gap. This has left an academic education gap for the students to learn the psychomotor skills as well as to nurture upon their affective domain. Considering the situation it would be preferable if we could work out certain online modalities to help bridge the gap as far as clinical education and clinical skills are concerned. To compensate for this loss the colleges and the university adopted the idea of conducting live streaming videos of the clinical based procedural steps that are performed by the students in the clinics as well as in the pre-clinics as far as the clinical skill training is concerned.

This demands the universities to be technologically and architecturally well-equipped with skill lab facilities and also the expertise to be trained for the same.

Skill-lab training follows a structured teaching concept, takes place under supervision and in consideration of methodological-didactic concepts, ideally creating an atmosphere that allows the repeated, anxiety and risk-free practice of targeted skills. The skill lab facility can be effectively used for training purpose through simulations. The flowchart depicts the essential components of the system. (Fig: 1)

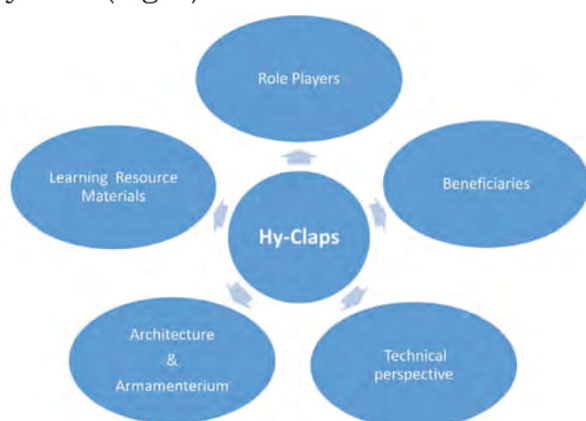


Figure 1: Workflow Essentials:

**Role players:** Role players are the vitals of the e-learning modules. The duty of the role player being the demonstration of the assigned clinical/procedural steps. The Role Player can be clinician/lecturer or subject expertise. (Figure 2)

#### Duties of Role Players:

- Identification of the competencies for demonstration.
- Preparation of the resource material for the students
- Formulation of the standard operating protocol for the assigned clinical step
- Demonstration of the assigned clinical step.
- Feedback from the trainee students
- Home assignments to be given to the trainee students in the form of video
- Evaluation of the assignments by the clinical expertise and feedback for the same.

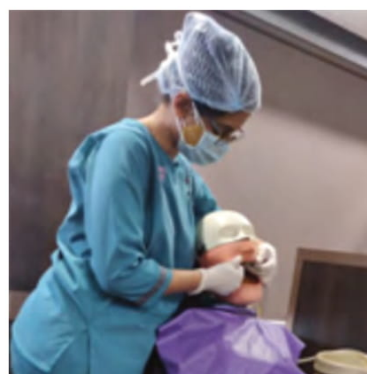


Figure 2: The role player- Clinical Expertise demonstrating Clinical step of Impression making through live streaming.

**Beneficiaries:** The Undergraduate students undergoing the training in dental college are the beneficiaries of the system. The students undergoing the training should be oriented with the architecture



and armamentarium which will be involved in the e-learning module. Orientation of the students to the facilities available and acquaintance with the technical mode to be used in the module.

The students should be categorised into batches for the quality teaching, evaluation and feedback. The students are provided with the e-Learning material as per the schedule assigned for the demonstration by the clinical expertise. The students are connected to the live streaming videos by the team expert and are allowed for the Q & A session (Question Answer) at the end of the demonstration (Figure 3 & 4). The students should be assigned tasks which need to be completed using the standardised patients or models of the competencies identified by the clinical expert. The assignments need to be uploaded onto the software by the students using their allocated identification given by the institution.

The Clinical expert evaluates individual assignments with comments on the assignment uploaded on the site and uploads the corrections identified with the justification. Fulfillment of the feedback forms are must as it gives an idea about the system and its effectivity.



Figure 3&4: Illustrates demonstration by the clinical expertise to the beneficiaries of the assigned identified competencies through live online streaming.

**Technical Perspective:** Technology

quality, hardware & software equipments, reliability, compatibility and accessibility are the main determinants in making an effective learning system.<sup>5</sup> The students and the clinical expertise team should be oriented about the system and the workflow. the role these technologies play in the educational forum actually determines the impact.<sup>6</sup> The most commonly used systems includes: **1. CMS**-Content Management System; **2. LMS**-Learning Management System; **3. CSCLS**-Computer Supported Collaborative Learning System; **4. Shared memory** (i.e., shared knowledge basis supporting professional communities of practices, COPs).<sup>6</sup>

**Architecture and Armamentarium:** The use of simulator technology has received much attention in health care education. The virtual reality-based technology (VRBT) designed for the instruction of dental procedures was introduced in the late 1990s. The simulation systems such as, the Haptic technology and the Virtual reality-based technology (VRBT), are interactive computer programmes that simulate real-life clinical scenarios in which the student acts as a health care professional.<sup>7,8</sup>

High budget investments or Cost factor might be the major concern for the institutions planning to adopt these e-learning systems.



(Figure 5: Skill lab facility for demonstration as the infrastructural advancement can be made available )



**Learning resource materials:** The students should be provided with presentations and standard operating protocols for each clinical steps for ease of understanding during live clinical demonstrations, online access to learning materials and e-library.

**Advantages of e-learning modality<sup>9</sup>:**

1. Problem-based learning approach development (PBL)
2. Visualising concepts in the form of patient simulations and multi-media instructions,
3. Providing immediate feedbacks, thus augmenting the self-paced and self-directed learning approaches
4. Increasing motivation towards learning
5. Can be adopted during pandemics, when classroom teaching is of inconvenience.
6. Technologically updated.
7. Ease of Recorded video retrieval by the students for self-learning anytime, anyplace

**Disadvantages of e-learning modality:**

The primary disadvantages, however, included;

1. High costs of investments
2. Lack of faculty development programmes to help faculty acquire e-learning skills,
3. The absence of face-to-face contact with students
4. Lack of instructional design and development support
5. Lack of incentives (e.g., no faculty release time),
6. Lack of rewards (e.g., web-based learning development does not always count towards promotion and tenure),
7. Lack of interest among some of the faculty

8. Lack of time to develop and maintain web-based materials.<sup>10</sup>

**Discussion:** E-learning includes a variety of modalities and terms such as online learning, mobile learning, blended learning, computer assisted instruction, distance learning, e-teaching, mediated learning, simulation-based learning, and virtual learning, each one of these having their own operative differences but all part of the digital learning ecosystem.<sup>11</sup> However, independent of the modalities, e-learning is built on three key elements: the various pedagogical models, the instructional and learning strategies, and the pedagogical tools or online learning technologies.<sup>12</sup> A thorough cultural transformation in the education system, following standardization, validation, and equivalence testing, is necessary to ensure an appropriate blended curriculum of traditional face-to-face teaching and e-learning.<sup>13</sup>

**Virtual reality (VR)** technology has been defined as a method by which a three-dimensional environment is simulated, giving the user a sense of being inside this environment, controlling, and interacting with it.<sup>14</sup> It has been used for patient education, medical students' training, instruction of surgical procedures<sup>15</sup>, and recently in dental training.<sup>16,17</sup>

**Augmented reality (AR)** is a superimposition of computer-generated graphics over a real-life scene, and unlike VR, the actual situation is not entirely suppressed.<sup>18</sup> In dentistry, it has been used in the training for dental implants, maxillofacial surgery, temporo-mandibular joint motion analysis, and prosthetic surgery, permitting the student/dentist to envision deep masked structures, allowing for a 3D planning of the surgical procedure, and even designing virtual surgical guides.<sup>16,19</sup>



A qualitative study evaluated the learning experience of dental students who used Internet Visual Resources (IVRs), defined as, visual materials and found that the most commonly used IVRs were videos of clinical demonstrations performed on real-life patients. This tool was especially helpful for the beginners. This form of visual aid was more attractive to students than reading the procedure from a textbook.<sup>20</sup> Continuing dental education programs have benefited from webinars, online courses, and web-based learning tools as an attractive and lucrative option because of the capacity to deliver constant training, increased learner convenience, flexibility of the process, personalized learning options with lower costs and the ease of delivery.<sup>21</sup>

Camargo LB 2014<sup>22</sup> evaluated the potential of an e-learning strategy in teaching Atraumatic Restorative Treatment (ART) in undergraduate and graduate dental students and concluded that the e-learning strategy has the potential of improving students' knowledge of ART. Mature students perform better with this teaching modality when applied exclusively via distance learning. Weiner CK et.al. 2016<sup>23</sup> Evaluated the use of web-based simulation of patients (Web-SP) in oral surgery education for dental students and to assess its impact on learning outcomes regarding clinical reasoning and showed a statistically significant increase in knowledge and that the students had a positive attitude towards the teaching method. These results suggest that Web-SP is a valuable tool for oral surgery education. Bolteho in 2019<sup>24</sup> evaluated the feedback of student's access to recorded clinical videos through Learning management Systems (LMS) and concluded that videos helped in their learning, preparation for simulation laboratory classes to refresh their memory

prior to clinical care, prepare for the clinical competency test and prepare for examinations.

**Considerations:** A key aspect in implementing e-learning strategies in Dental Colleges is that virtualization is not a choice, but a process, and all the involved sections need to take action and make decisions to transform the established paradigms and move forward. As seen recently, many Dental Colleges began this virtualization process without the necessary preparation. The abrupt closure of the universities worldwide for the COVID-19 emergency, although undesirable, represents an enormous opportunity to some Dental Colleges to start this process and to expand the virtualization environment as a teaching/learning experience.

**Implications of the concept:** The concept was initiated and innovated by the esteemed Datta Meghe Institute Of medical sciences, Sharad Pawar Dental College, Wardha. This very own concept was formulated and applied onto the learning system of the undergraduate students during this pandemic conditions and is still followed. This hybrid concept of video demonstration of the clinical exercise along with the provision of e-learning material to the students enhances the cognitive and psychomotor domains of learning. This concept was being piloted on the undergraduate dental students. The concept can be feasibly be adopted by other institute as the learning modality. This concept is copyrighted under the "Copyright Act, 1957" titled as "SOP (Standard Operating Protocol) for Clinical/practical skill training through hybrid protocol (Simulations and Standardised patients)



**Conclusion:** As discussed previously, several reports support the use of virtual educative aids in dentistry. Although the academic institutions can implement few modalities easily, most of them require trained personnel and a sound budget to

support the necessary infrastructure and equipment. Using these academic tools may vary among the disciplines, as well as their acceptance by the students and teachers.

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