

An Introduction to E-Content Producing Algorithm for Screen-Recorded Videos

J. Darsareh, M. Nikafrooz

Abstract—Some teachers and e-content producers, based on their experiences, try to produce educational videos using screen recording software. There are many challenges they may encounter while producing screen-recorded videos. These are in the domains of technical and pedagogical challenges like; designing the production roadmap, preparing the screen, setting the recording software, recording the screen, editing, etc. This article presents some procedures for producing acceptable and well-made videos. These procedures are presented in the form of an algorithm for producing screen-recorded video. This algorithm presents the main producing phases, including design, pre-production, production, post-production, and distribution. These phases consist of some steps which are supported by several technical and pedagogical considerations. Following these phases and steps according to the suggested order helps the producers to produce their intended and desired video by saving time and also facing fewer technical problems. It is expected that by using this algorithm, e-content producers and teachers gain better performance in producing educational videos.

Keywords—E-content, educational video production, screen recording software, screen-recorded videos, e-content producing algorithm.

I. INTRODUCTION

THE use of e-content in all forms of education, including e-learning and traditional education, is a necessity for the educational setting. The development of ICT has influenced and changed the learning approaches and also the world of e-content. These changes have encouraged educators and institutions to produce e-content [1]. However, in the production of this content, there are some technical and pedagogical thoughts that must be considered by content producers and developers.

Video as educational material has a special place among all types of e-content and plays an important role in e-learning. Video is defined as electronic recording, which includes both audio and video elements, and has been used for decades to teach science and also for communication [2], [3]. The use of video as an e-content in teaching and learning has attracted a lot of attention in recent years and has already developed to support adaptive and self-paced learning. Videos can be used to introduce new content, review, or reinforce important

content that was previously introduced or taught [4]. In addition, video is increasingly used for coaching, mentoring, and professional development in educational institutions [5].

People learn more deeply from a combination of words (spoken text or printed text) and pictures (images, diagrams, photos, animations, or videos) than from words alone. Video as a combination of word and image presentation should therefore promote learning [6]. Decades of research have shown that video can be used to improve learning. Allen & Smith [7], Kay [8], Lloyd & Robertson [9], Hsin and Cigas [10], Stockwell et al. [11] in their studies have shown the effective role of video as an educational tool. Other studies also showed the effectiveness of video on learning and teaching. Mayer stated that the combination of verbal instructions with visual images significantly increases the ability to remember and recall in the students [12]. Issa et al. mentioned that the effect of the video content can also be increased through approaches based on multimedia learning principles [13].

With the rapid rate of video producing and using them in educational settings, a different type of video emerged. In recent years, screen recording for learning software operation has received a great deal of attention. These videos are produced by using screen recording software. This software enables the teacher to record the entire screen activities and then to prepare and present it in the form of an e-content. This software can be used to produce videos to teach a variety of computer-based skills. Instead of presenting content in the form of texts or books, the teacher can easily teach the students the desired skill in a short period of time by producing these videos.

Instructional videos that include the steps of working with a computer have proven to be effective to learn how software works [7], [14]. Brick & Holmes have shown that teachers use screen recording to provide video feedback to learners, and it had a positive effect on their learning. Some evidence from the study suggests that learners, value this type of feedback and find it clearer than traditional ones [15]. Fernández et al. have shown that using screen recording has many benefits in teaching and learning [16]:

- It provides a convenient way to help students study and explore in classes or in extra-curricular
 - It can easily be shared among students
 - It can be accessed from many electronic devices
 - It can be viewed at a time and place that suits the student
- Screen recording can help teachers and students in a variety of ways. It supports students through:
- Provision of various teaching techniques for learning

Jamileh Darsareh is with Organization for Educational Research and Planning, Tehran, Iran (phone: +989364245138; e-mail: j.darsareh@gmail.com).

Mohammad Nikafrooz is with Department of Education, Faculty of Teachers Education, Farhangian University, Chamran Branch, Tehran, Iran and also working at Organization for Educational Research and Planning, Tehran, Iran (phone: +989370256806; e-mail: m.nik60@gmail.com).

- Increasing students' motivation and improving the learning experience
- Simplifying and explaining complex problems
- Allowing students to access the learning materials as often as necessary
- Allowing students to study at their own pace, with instant play, rewind, and pause

And they can support teachers by:

- Reducing the feeling of isolation for cloud-based students, but also helping the students on-site to feel connected
- Allowing teachers to insert short snippets of interesting and relevant messages that involve students in current real-world examples
- Giving teachers more time to manage and guide students in subjects or units, such as studying computer courses
- Reusing the recorded video

To create an effective screen-recorded video for educational purposes, many technical and pedagogical considerations must be taken into account. Nikafrooz and Darsareh presented 85 pedagogical and technical considerations for producing screen-recorded videos. They categorized these items into five domains: pedagogy, recording, video file, editing, and publishing. They believed that by noticing these considerations, producers can increase the quality of their productions [17]. Therefore, it is important that educators, facilitators, instructional designers, and others engaging in e-content development are aware of these considerations. They need to have sufficient knowledge and skills in working with screen recording software and also editing software [18]. So, it is necessary to support them by providing a guideline containing the required training materials.

To support teachers or e-content producers with training materials and resulting in producing valuable and well-formed video, a meticulous guideline is needed. Moussiades et al. proposed a framework for the effective development of educational video in their work. Their proposed framework consists of a methodology and a set of design guidelines, that both were oriented towards achieving the learning objectives related to an educational video [19]. In another study, Castillo et al. proposed a three-step guide to producing video: pre-production, production, and post-production. They claimed that by using these steps, educators can begin their low-budget video-production journeys [20]. Mehrabi also presented a structure and process for e-content development which contains the teams dealing with e-content production, their task, and the final product of each team [21].

Nowadays, the spread of e-content production in the form of screen recorded video to produce educational material has increased among teachers to support students and learners to achieve learning objectives. During screen recording, some producers may face some technical problems. These problems associated with video production are as follows:

- Screen recording without any plan and map
- Lack of attention to the prerequisites and sequence of steps
- Performing repetitive and time-consuming steps
- Lack of technical skills

- Lack of knowledge associated with the screen recording software capabilities

Therefore, it is necessary to have a simple and practical roadmap or guide to produce an educational video. This article presents a guide to video production in the form of an algorithm to cover some problems and needs of producers.

II. THE ALGORITHM

This paper introduces a guideline in the form of an algorithm to assist the producers. In the context of computer science, an algorithm is defined as a series of actions that must be performed in a specific order to solve a problem. This definition is made up of two concepts: actions and sequence of actions [22]. In this paper, the concept of algorithm is used to show that some specific actions need to be done in a certain order to produce a high-quality screen-recorded video.

A. Algorithm's Features and Phases

This algorithm is designed to support beginner educator-producers to decrease the problems arising during producing screen-recorded videos. So, this algorithm presents a workflow to help producers in producing effective and high-quality video in a straightforward manner. The main features of this algorithm are as follows:

- Providing a straight guideline for producers
- Consisting all critical phases and steps in production
- Presenting all steps in a specific order
- Enabling the producers to create video by spending less time and effort

This algorithm is organized in five phases: design, pre-production, production, post-production, and distribution (Fig. 1).

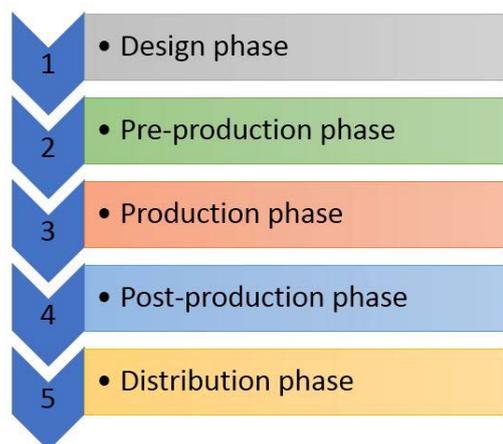


Fig. 1 The overall workflow of screen recorded video production

Design phase covers lesson plan and scenario, pre-production phase consists of steps that include media, hardware and screen recording software preparation; production phase covers recording the screen based on scenario; post-production includes editing, reviewing, and exporting video; and finally distribution phase includes publishing video and getting feedback from audiences. These

phases help producers to realize the procedures and mechanisms of screen recorded-video production. It is to say that categorizing these steps into five phases does not affect the final output, but the order of phases and the steps in each phase are important. Each phase consists of several steps that must be performed in sequence. Therefore, by following the steps of each phase, producers will achieve the desired goals by spending less time, effort and encountering fewer problems. So, it is expected that by using this guideline and algorithm, e-content producers could be able to produce high-quality content.

B. Design Phase

Design phase, as the first phase, plays a crucial role in any screen recording production projects. This phase is one of the most important phases that focuses more on educational and pedagogical issues. The goal of this phase is to guide producers through the production workflow. Paying less attention to steps of this phase may cause several problems like; doing some redundant tasks, spending extra time and effort, decreasing the educational value of video etc. So, considering the steps of this phase prevents such failures and mistakes. In the algorithm introduced in this paper, the design phase consists of two steps: Preparing lesson plan and designing scenario (Fig. 2). If these two steps in this phase are done well and carefully, the producer will face fewer problems in the next phases.



Fig. 2 Steps of design phase

The steps of the design phase should be done as follows: First, the instructor or producer should develop a lesson plan related to the educational subject. The lesson plan includes general and detailed educational objectives along with the teaching method, examples and exercises related to the

educational subject. Then a scenario should be prepared based on the lesson plan. In the scenario, it should be specified when, what and how to do, and the narration should be written. Training-related materials that will be added to the recorded video, such as text, images, audio, etc., should be specified in the scenario and then the timing of the narration and operations need to be determined.

C. Pre-Production Phase

The pre-production phase, as the second phase of video production, deals with technical issues. In this phase, the producer is expected to be familiar with some technical issues related to computer hardware and software. The pre-production phase consists of six steps: preparing required media, preparing hardware, installing and testing screen recording software, workspace arrangement, setting screen recording software, and recording demo (Fig. 3).

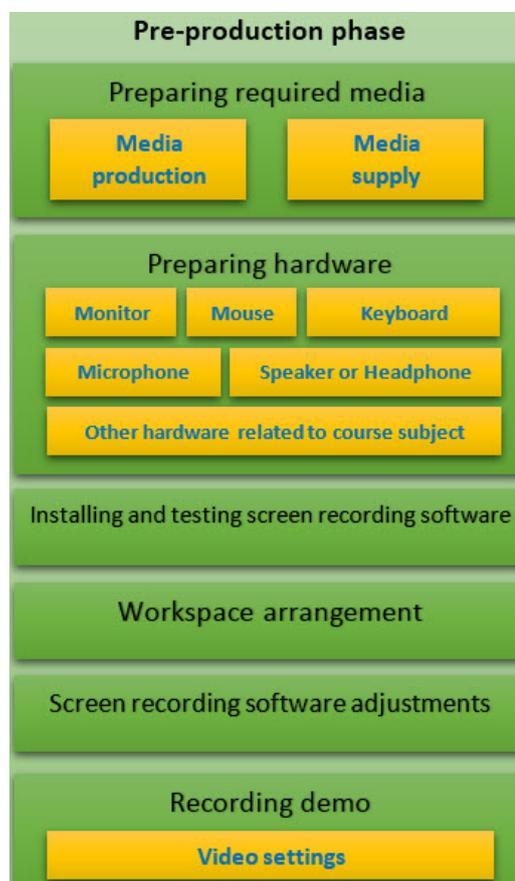


Fig. 3 Steps of pre-production phase

The steps of the pre-production phase should be done as follows: First, by reviewing the scenario and lesson plan, a list of media to be used in the educational video needs to be extracted. These media and elements can include text, image, sound, music, videos, and so on. Adding these additional elements can enrich the video and help the viewer to focus on the main key concepts or major points [20]. The media that are used in the educational video can be produced by the producer or outsourced. Then the required hardware must be provided

and prepared. This hardware is either used to make videos or is related to the subject of training. Then the screen recording software should be installed, and its correct operation should be ensured. After arranging the workspace, the recording software should be configured and the recording operation begins to produce a demo. In this step, all video settings need to be checked. The purpose of producing a demo is to check the performance of the recording software and to evaluate the video output.

D. Production Phase

The production phase, as the third phase of video production, deals more with technical issues. Production phase refers to all activities that involve recording the screen. In this algorithm, production phase consists of two steps that should be done practically for creating educational videos (Fig. 4). In screen recording video, the production phase begins when the recording button of the software is clicked. The screen recording operation is performed based on the scenario from the previous phase, by taking into account the recording considerations and standards. The operations involve recording screen, audio narration, and/or recording instructor's image. Typically, the built-in microphone or, even better, a separate microphone will capture the audio and combine it with the screen-recorded video. Educators or video producers can also use built-in cameras to record the instructor's image simultaneously with the screen. Videos may be recorded as a single file or multiple files. Because these videos are not edited at this stage, they are named as raw parts. Therefore, to make the process of finding and editing the video easier it is recommended to categorize the raw parts at this stage.

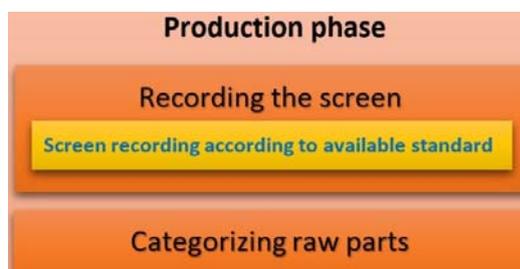


Fig. 4 Steps of production phase

E. Post-Production Phase

Post-production encompasses all efforts occurring after production of the video. In the mentioned algorithm, this phase consists of four steps (Fig. 5). The most important step in this phase is video editing. It is recommended that the activities in this step are performed in order and carefully. First, all the extra frames must be removed. Then the media produced or supplied from the previous phase need to be inserted. Noise removal and volume adjustment is done in this step. Finally, sound or video effects and transitions are applied by considering the educational considerations. After these steps, the draft output or rough cut is prepared. Then the rough cut should be reviewed and evaluated by the producer and specialists. For rough cut revision or evaluation, it is better to prepare a checklist and evaluate it based on technical and

educational criteria. If the video needs to be edited, the editing operation is performed again, otherwise the final video is prepared and the next phase starts.

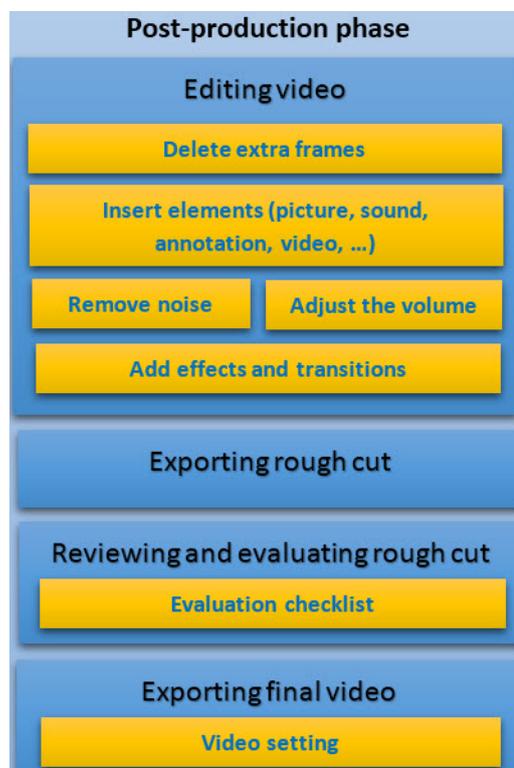


Fig. 5 Steps of post-production phase

F. Distribution Phase

Distribution phase as the last phase of the mentioned algorithm encompasses all efforts occurring after production of the final video. This phase consists of two steps: publishing video on platform and getting feedback from audiences (Fig. 6). Video for educational purposes can be distributed in different ways:

- 1) Online:
 - Uploading on a website or a VOD platform like YouTube
 - Using as a part of an online course
 - Presenting on content or learning management systems CMS or LMS
- 2) Offline:
 - Sending and distributing by media (CD-DVD)

One of the issues that may be overlooked in the production of educational videos is getting feedback from the audience. Since the purpose of producing educational videos is to achieve educational goals, it is necessary for the producers to receive the opinions of audiences to improve and revise educational videos in future. In addition, feedback helps to improve communication and interaction between teacher and learner. Receiving audiences' feedback can be done in different ways, directly through the publishing platform or through SMS, email or so on.



Fig. 6 Steps of distribution phase

III. DISCUSSION AND CONCLUSION

The COVID-19 pandemic has changed the way of learning and teaching processes and challenged educators to adjust educational goals to fit online teaching. During this era, many educators tried to find the appropriate e-content to enrich their teaching, on the other hand, some educators attempted to produce their required and desired materials by themselves. These educators can be positioned as designers and producers in a way that they may not have been earlier during their previous teaching experiences. They record the screen and add narration to make an e-content to present to their students. But during producing screen-recorded video, some novice producers may encounter problems. This article outlined an e-content producing algorithm for screen-recorded videos to enable producers to create high-quality and effective educational videos in less time, labor and with fewer problems. Although making a video may seem like a challenging task, it is easy to do according to a guide that covers all the steps of producing a screen-recorded video. In this article, a simple and comprehensive guideline as an algorithm for producing these videos across design, pre-production, production, post-production and distribution phases was introduced. Each of these phases consists of steps that help educators to go through and result in high-quality video. The design phase is related to the lesson plan and scenario. In this phase, determining the goals and the series of activities to be done as a scenario are prepared. Pre-production phase includes some fundamental tasks that should be done as prerequisite for production video. These tasks include preparing the required media, hardware, software and making a demo. Production phase directly deals with those tasks related to production. This consists of implementing the design and plot depicted in previous phases. Post-production encompasses all efforts occurring after production of the video. The most important step in this phase is video editing. Distribution phase is directly related to publishing and presenting the product to the audience, and also getting feedback from them in order to increase the quality of later products. In this phase, the medium, and platform for presenting the videos and the way for communicating with audiences will be set. So, it is intended that by using this algorithm, producers create videos with higher quality.

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