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Content Creation and Pedagogic Strategies for Skill Development MOOC

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Abstract: Skill development is being promoted throughout India, as a channel to create employable resource. Massive Online Open Courses (MOOCs) can provide a platform to enable such skill development programs at scale. The IITBombayX course, Basic 3D animation using Blender (SKANI101x), was the first of its kind offering of a Skill Development MOOC (sdMOOC) for the Indian learners. Over its two offerings, 6457 participants registered, 2465 (38%) were active and 1132 (19%) were certified. However while producing and conducting the course we realized the lack of content creation and pedagogic strategies for such sdMOOCs. Analysis of our pilot offering of SKANI101x, highlighted its effectiveness for both, first-time and experienced online learners. In the second offering we modified pedagogic strategies to foster student-instructor interactions that resulted in higher engagement and completion rate. This paper discusses the rationale of the decisions and reports an evaluation study of participants' performance, engagement, and perceptions regarding the components of the course over two offerings. This provides an evidence for the effectiveness of the content creation and pedagogic strategies implemented.

Keywords: Skill development MOOCs, 3D animation skill development, content creation for MOOCs, pedagogic strategies for skill development MOOCs, IITBombayX, SKANI101x,

1. Introduction

Skill development is being promoted as one of the national programs in India (www.nsdcindia.org). Traditional teaching methodologies for skill development aren't enough to cater to this growing need. Therefore, online education initiatives are encouraged to reach out to the masses. Out of various popular domains, animation and visual effects are sought after, since they are considered creative and glamorous. These sectors show a growth of ~13% and expected to double in next five years as foreign studios eye Indian talent (Hirata, 2013; FICCI-KPMG report, 2015). However, lack of enough opportunities in formal education for animation limits the number of skilled personnel. Animation education in India has two clear sections. One section is of classical animation education available at reputed institutes (NIDs and IITs). These institutes focus on animation as a medium of communication, and the various presentation approaches. The intake of these institutes is severely low, in comparison with the growing demand. On the other hand, commercial animation training centers are mushrooming all over, who focus on the animation software tools. The students of these schools are aplenty; however they are typically categorized as software technicians, than creative animators (Sabnani, 2005). Animation students in India aspire for well-structured animation course, having appropriate balance of creativity and software skills, available at a low cost. Animation courses in Massive Online Open Courses (MOOC) format can address this gap. We offered a SKill development course on ANImation (SKANI 101) on IITBombayX (www.iitbombayx.in). It had two offerings where a total of 6457 participants have registered. Out of these, 2465 (38%) were active and 1132 (19%) got certificates. This paper presents the content creation and pedagogic strategies implemented in this course along with the evidences to show its effectiveness.

2. SKANI101x: Our offering of skill development MOOC

IITBombayX was established in 2014, with an objective of creating and imparting high quality academic content, across the country using the MOOCs. It is built on the Open edX platform. We choose Blender as the free and open source 3D computer animation software to demonstrate the

modeling and motion in SKANI101x. Use of Blender, makes it accessible for anyone to practice, without spending on the license cost. This introductory course was designed for learners who were novice in 3D animation and might be first-time online learners (FLs) or experienced online learners (ELs). The content was designed, so that both the learner groups would find it useful. The 8 weeks course was offered twice. The first offering was from July 2015 to September 2015 and the second offering was from February 2016 to April 2016. The demographics of the course and its registration and completion statistics are given in Table 1.

Table 1: Participant demographics in the 2 offerings of SKANI101x

Year of offering		**2015 (OF1)**		**2016 (OF2)**	
Number of Students Registered		1393		5033	
Number of Students Certified		**125 (9%)**		**1007 (20%)**	
Registration from number of States (Cities)		27 (404)		32 (988)	
Distribution of Area	Rural	365	23.81%	1427	27.67%
	Semi-urban	325	21.20%	749	14.52%
	Urban	775	50.55%	2891	56.05%
Gender	Male	1037	69.09%	2908	57.37%
	Female	464	30.91%	2161	42.63%

2.1 Course objectives and its content

The primary learning objective for the course was: After taking this course, the participant should be able to use Blender software to create a video (~20 seconds), by applying basic animation principles. In order to achieve that, concepts from various domains were incorporated in the course design and the following as the instructional plan:

Animation principles: Animation principles formed the core of the course. However, since this was a short course (8 weeks), only two important were dealt in details. They were: i) Stretch and squash principle and ii) Timing and spacing principle. Activities and skill of using Blender were woven around these principles.

Blender skills: A range of Blender operations like transformations, modifications, animation, and rendering were demonstrated in order to achieve the learning objectives.

Other allied concepts: In addition, to the animation principles and the Blender skills, there were some generic concepts included in the course. These were necessary to provide a complete view about 3D film making. These include: visualizing 3D space, concept of camera, and rendering of an image using software.

3. Design rationales for SKANI101x

Most of the MOOCs follow the pattern of having weekly videos, assessment quizzes, and active discussion forums (Bali 2014). SKANI101x being a course on skill development, needed some modifications in these strategies. Our modifications while creating the content and implementing pedagogy are discussed here.

3.1 Content creation strategies

These strategies were based on standard processes instructors follow to create MOOCs. Slides have bulleted details, videos have face and screen, and quizzes have MCQs. Few modifications done to the process, considering the software demonstration components are as follows:

Videos: Generally, MOOC videos are a combination of slides and instructor's face video (talking head). Software demonstration videos are mostly screen-capture, with talking head video used sparingly (mostly using picture-in-picture: PIP). For SKANI101x, we shot the faculty video using a green screen backdrop. Later, the editors/compositors placed the instructor's video (using Chroma removal effect) at a convenient position, without obstructing the screen capture/slides (See Figure 1a).

Slides: Textual explanation of the concept with examples, or stepwise (software) process with screenshots was added to the slides. Highlights were used to amplify the important areas on screen

(Graphic design principle: Visibility). The objective was to facilitate the users to perform processes, in case video is not accessible, by referring to the slides.

3.2 Pedagogic strategies

Pedagogic strategies applied to the course structure and the assessments created for OF2 are:

Selection of course structure: The structure of SKANI101x is a combination of concepts and skills in animation film making. In order to keep the interest levels high, the concept lectures were interspersed with the skill/software demonstration lecture videos. The challenge was to retain the interest level for both group of learners (FLs and ELs), by having an equally interesting line up of the topics in the course. The strategy used was to have a level wise full loop of start-finish of the 3D content creation then introduce details in a spiral. This strategy helps in giving a feeling of completeness at the end of every loop, rather than the anxiety of 'how much more before I can make my own model/video'.

Quizzes: As a strategy, the quizzes were placed in the subsequent week, in order to provide sufficient time for practicing the skills. The quizzes have three types of assessment questions: (a) Recall shortcuts used in Blender, (b) Locate the particular icons/windows in the given screenshots and (c) Select the correct steps to perform a particular action in Blender.

Assignments: The assignments were not graded; however, the submissions were often uploaded on the discussion forum, to encourage participation (Bali, 2014). In the first three assignments, an image was provided for the participants as a 'key', which they had to match. Later, the instructors removed the image and gave just the description. This made the submissions open ended, and participants were able to visualize freely. Few voluntary submissions surprised the instructors (See Figure 1b).

Discussion forum activities: Indian language usage (Hindi) was tried to encourage the participants who didn't have confidence in English communication. Using the personalization strategy, attempts of involving the participants were made, such as: asking for introductions in the beginning of the course, asking to post 'selfies' at the end of course etc. As done in most of the xMOOCs, the forums were moderated to enable discussions related to the assignments/quiz questions.

Additional interaction strategies: Different channels of interactions were offered for various types of participants (see Figure). Individuals were contacted through emails and phones. Small groups had an option of a Skype call, in addition to the options for the individuals. Classrooms and communities (participants enrolled in a town) used Google hangouts in addition to other options mentioned above.

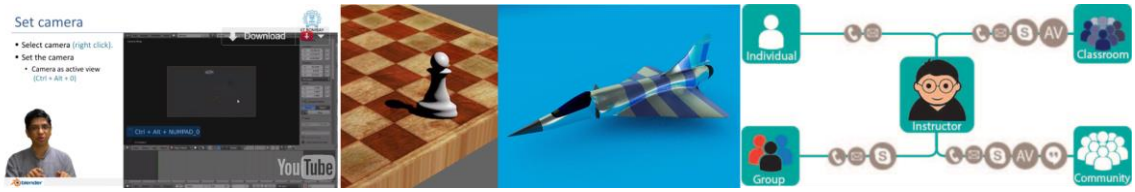

Figure 1: a. Screen shot of video lecture, b. submitted assignment and c. interaction options

4. Evaluation study

We conducted an evaluation study of the two offerings of SKANI101x with an objective to understand effectiveness of our content creation and pedagogic decisions taken. Following previous study (Sahashrabudhe and Majumdar, 2016) we evaluated whether the decisions taken to design and implement the course helped both groups, the *First-time Online Learners (FL)* and the *Experienced Online Learners (EL)*, to develop their animation skills. Our research questions were the following:

1. Are there differences between the two groups of learners with respect to their performance and perception of learning achievement?
2. Are there differences in *perceptions regarding contributions of various MOOC components towards learning of 3D animation skill* for both groups of learners?
3. How did the *engagement levels* of the participants change across the two offerings?

Research Methods: Overall methodology of the study is mixed methods. We had collected quantitative data of the participant's performance, engagement and perception during the course. Additionally we have open-ended participant feedback and interviews of sampled learners. In this paper we report the analysis of the quantitative data collected across the offerings.

Instruments: One of the questions in the entry survey, asked the enrolled participants regarding their prior exposure to online learning. Further we adopted validated questions from the SALG survey (Seymour, 1997) to elicit participants' response of their perception and preferences in the exit survey. For the former there were 5-point Likert scale questions (with 5 being most desirable) and the later had multiple-choice questions. The first two questions elicit the perception regarding learning gain and ease of learning during the course. The third question inquire the degree to which different components of the course has enabled learning. For the first offering we considered 5 components of the MOOC: *videos, slides, quizzes, assignments*, and *discussion forums*. For the second offering we added the component of *instructor interaction*. Apart from the surveys the course assessment quizzes and certification criteria were instruments to measure the learner performance. Additionally, we analyzed activity logs recorded by the IITBombayX platform and the number of submissions of the 9 ungraded assignments to understand learner engagement.

Analysis methods: Based on the Entry survey response we first segregated the two groups of *First-time (FL)* and *Experienced Online Learners (EL)*. We analyzed the first two RQs from the perspective of these two groups. To answer RQ1a, we compared the quiz performance of the participants and the proportion in each group who got the certificate of completion. Further for RQ1b the difference in the perception of learning achievement of the two groups are tested for statistical significance by Mann-Whitney Test. To answer RQ2 we analyzed the distribution of learners' self-reported perception of help in learning for each 5 components of the MOOCs respectively. Videos and slides were the MOOC resource components, quizzes and assignments were the activity components and interactions were facilitated either on discussion forums or outside the MOOC platform through multiple channels with the instructor and his team. We investigated the ordinal response and significance of the statistical differences between groups by conducting Mann-Whitney Test for two independent samples. Within each group we carried out a pair wise chi-square (χ^2) test to determine whether the perceived helpfulness of each component has dependence on others.

Participant Sample: In the second offering of the course 2367 participants filled in the entry survey and 564 filled the exit survey. 514 participants filled at least one question in both entry and exit survey. Among them 458 participants were certified. We have considered the number of participants who logged in more than the minimum number of days required for completion of the course as active participants. For the first offering it was 4days (Referring to **Error! Reference source not found.**4) and there are 298 (21% of enrolled) active participants and for second offering it was 2days (**Error! Reference source not found.**) with 2167 (43% of enrolled) active participants.

Results: 2313 participants gave their status of prior exposure to online learning. 835 (36.1%) of them got certified. 582 (35.2%) FL and 253 (38.4%) EL got certified. Considering the grades of 63 FTL and 30 EL who got certification at the end we found that the differences are not statistically significant (median: FL 0.945, EL 0.945; U=899; p=0.35). Figure 3 reports the distribution of perception of learning achievement for the two groups as collected in the exit survey. Statistical tests confirm that there is no significant difference in them (median: FTL, EL 3; U=9124.5; p=0.4421). These two results answer our RQ1 that the second offering of SKANI101x also had similar learning achievements for the first time and the experienced learners.

Table 2 reports the mean value of the perception response regarding the degree of helpfulness of the MOOC components and the Mann-Whitney test results for the two groups of learners. Mean response of both the groups were above the *moderate help* (value: 3) for videos, slides and quizzes. The mean value for the discussion forum is above the *little help* (value: 2). For the EL group the Interaction with instructor had *much help*. But overall for each component, between the FL and EL groups, the differences were not statistically significant.

Table 2: Participants perception of the degree of help they receied from the components of MOOC

	Video		**Slides**		**Quizzes**		**Assignments**		**Discussion forums**		**Interactions**	
	mean	std	mean	std	mean	std	mean	std	mean	std	mean	std
First-time	3.6	0.7	3.2	1.2	3.6	0.8	3.5	0.9	2.6	1.5	3.7	1.3
Experienced	3.7	0.6	3.4	1.2	3.3	0.8	3.6	0.9	2.9	1.5	4.0	1.1
U	885		836		742		869.5		850		839.5	
p	0.296		0.178		0.038		0.255		0.216		0.189	

Within the FL group there is a significant dependence between perception of assignment and quiz (χ^2=32.35, p=0.001, dof=12), slide and quiz (χ^2=32.11, p=0.006, dof=15) and video and quizzes

(χ^2=16.99, p=0.04, dof=9) on their helpfulness on learning. In EL group slides and quizzes components had significant dependence (χ^2=19.541, p=0.012, dof=8).

The participants' login activities during the period of the course shows on average 66 (5% of total enrollment) participants logged in everyday during the first offering, which increased to 308 (6% of total enrollment) in the second offering. Considering the 9 ungraded assignments of the course, the participants submitted a total of 454 assignments in the first offering (405 unique) that went up to 2633 (2339 unique) during the second offering. There was on an average 485% more number of assignments being submitted for each assignment during the second offering.

Instructor's reflections: One of the distinguishing features in this MOOC was the interaction options for the participants. It was observed that many participants were enjoying the 'wow' factor of interacting with the MOOC instructor/s informally. Many interactions had queries about career options in 3D animation, or advanced concepts in Blender. Table 3 shows the various interaction mediums and the actual number of participants who interacted.

Table 3: Interaction Activities during second offering of SKANI101x

Channel	A-view	Skype	Email	Telephone	Face2Face	
Number of interactions	13	8	6	9	4	Total
Number of participants	396	101	163	9	120	**789**

The other feature of this offering was the sustained effort to foster discussion forum by the team of instructors. Using interaction mediums apart from the discussion forum, helped in understanding the pulse of the participants. An experienced learner (who is a teacher), submitted a video with advanced features. The instructor asked him to share his process with the class, by creating a spoken tutorial video. He did that, and was well appreciated by the fellow participants. This type of encouragement, made ELs feel responsible, at the same time, it kept the interest level intact for the FLs.

5. Discussions and Conclusion

The second offering had 8 times higher completion rates as indicated in Table1. Further analytics of the participant's performance, perception and engagement data highlight that the second offering too was useful for both the FL and EL groups. The trends were comparable to the first offering in spite of enrollment number scaled up from 1393 to 5033 (361%). This is indicative that the content creation and the pedagogy strategies generate interest for the FLs and kept it high for the ELs. Although the survey result indicated no statistical differences between the two groups regarding helpfulness of any MOOC components, there were intra group dependencies amongst the components. The effects of quiz on learning were dependent on the video, slides and assignments for the FL group while the EL group only had dependence on slides. Possibly the groups realized that the assistance of the Blender shortcut lists provided in the slide which would be helpful to answer quiz questions when the resource was made available at the end. Similar to the first offering, content creation strategies (like video having faculty face + screen capture, highlighting the area of action etc.) were appreciated by the participants. The non-graded assignment submissions showed a vast range of the creativity of the participants in composing and complexity of the scene. It is also important to observe that the participants matched the necessary Blender skills to create their visualized artifact. It indicates given the open-ended nature of the assignments, it encouraged the participants to think about the artifact they wanted to generate and not bound them to replicate a specific model or animation. Auto grading of the assignments still remains a technological challenge. However, whenever technology supports it, instructors will have to create a rubric for the assessment of the assignments, and mini projects.

During the second offering, social presence of the instructional team helped retention of learners. Additional emails were sent during week 6, and 7 to address the issue of college final exams, which participants were bothered of. Additionally allowing extension of the quiz deadline saw that there was no drop in the number of submissions as compared to week 5. Discussion forum can be used in moderation to help additional engagement. Encouragement was provided to the submissions that surpassed expectations. The instructor observed an instance where a participant created a spoken tutorial to share the animation process with the entire class and when asking to develop a spoken

tutorial of the modeling process he could motivate the participant to do it. Also while opening up interaction through multiple channels it was observed encouraging en-mass classroom enrolment facilitated (a) peer interaction and (b) have a Coordinator to support the logistics. In this regard another participating college instructor gave this view: "I'm an Asst. Professor and I and my 60+ students got registered for this (Basic 3D animation) course. Really I'm getting huge response from lot of them. They are learning lot... The video lecture is more informative and interactive, these are very helpful to understanding basic concept, and presentation of video lecture is very good and useful. The all resources which is proving by IITBombayX is really nice".

SKANI101x is a first sdMOOC of its kind. Over the two offerings it could reach out to 6457 registered participants of which 2465 were active in the course and 1132 were certified. Over the two offerings though the course registration has grown 3.6 times, still there were 8.6 times more certifications during the second offering. In addition to following standard xMOOCs content presentation strategies, sdMOOCs needed some more modifications in content creation and pedagogic strategies. Second offering validates that skill development is a community-based activity. Even if xMOOC platform was used, fostering community building activities by social presence of the instructors have resulted in higher completion rate of the course. It has also resulted in sustaining the engagement of the participants. It can be seen that the course design has helped in the retention of the FLs and providing challenges to the ELs. Currently we are conducting a blended mode offering of SKANI101x. In future we would like to study the effectiveness of these three offerings.

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