EVALUATION OF E-LEARNING OF ANIMATION COURSES USING ATTITUDE, BEHAVIOUR AND OUTCOMES

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by

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Dedicated to the goddess of knowledge and to my family.

CERTIFICATE

This is to certify that the thesis titled, "**Evaluation of e-learning of animation courses using attitude, behaviour and outcomes**", being submitted by **Mrs. Aarati Prakash Khare** to the Indian Institute of Technology Delhi for the award of the degree of **Doctor of Philosophy** has been carried out under my supervision.

The research work contained in this thesis has not been submitted in part or full to any other university or institute for the award of any degree or diploma.

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ABSTRACT

Among the numerous usages of computers today, e-learning is emerging as an important use for mass education at low costs (Mason, 1998). Internet-based online courses have started facilitating all levels of education, including elementary, secondary and technical, etc. Even online design courses in general and animation design courses in particular, have started. Due to heavy demand from the animation industry, online courses in animation are highly sought after by youngsters seeking job opportunities in the animation industry (Ferdin, 2019, July 12). There have also been reports of high drop off rates of online courses (Woodley, 2004).

This thesis has identified the need to evaluate online learning courses, especially for design courses like animation where tacit knowledge is involved (Belas, 2017). This thesis has identified a gap in the literature that there is a lack of learning evaluation models for online courses and has proposed a new model for the evaluation of online courses. The evaluation model proposed in this thesis consists of six stages. The model starts with an evaluation of attitude towards e-learning, proposes to measure initial reaction towards the e-learning platform design, measure the ease of use of the learning platform, measure the engagement a learner has felt while exploring and learning from the e-learning platform, measure the learning the learner has undergone and finally evaluate the skill the learner has acquired. The proposed model has then been used to investigate learners' attitudes, behaviours, and outcomes through experimental studies.

The Learner's attitude was evaluated through semantic differential scales of 20 bipolar adjectives with 482 participants and it was found that there exists a difference in learner's attitude towards online and offline methods of learning. Next, the e-learning platform was designed and developed with seeded usability problems. Participants were invited in lab experiments to undergo learning using the platform. During the usage of the e-learning platform, Galvanic Skin Response (GSR) and behavioural data were collected, also before and after samples of drawing skills were collected. The findings suggest that difficulty in the usage of the e-learning platform directly affects the engagement levels of the participants and learning outcomes from the e-learning exercise.

So far the models of e-learning evaluation have not explicitly argued for the need to evaluate the quality of online learning platforms along with the learning content. The proposed evaluation model in this thesis has been the first attempt reported in the literature.

The findings of this thesis have illustrated how the usability of the e-learning websites directly affects the learning of the students from the website. The findings of this thesis have further established the need to evaluate e-learning platforms differently than the existing learning evaluation methods due to this dependence of learning about the learning media itself.

Keywords: e-learning, evaluation model, Information System Design (ISD), HCI, Usability, User Experience Design.

सार

आज कंप्यूटर के अनेक इस्तेमाल के बीच इ लर्निंग माध्यम सार्वजनिक शिक्षा के लिए कम लागत में सबसे बेहतरीन विकल्प के रूप में सामने आया है (Mason, 1998). इंटरनेट शिक्षा पर आधारित ऑनलाइन पाठ्यक्रमों ने हर स्तर पर शिक्षा सुविधा देने की शुरुवात कर दी है जिसमे प्राथमिक, माध्यमिक और तकनीकी शिक्षा शामिल है. यहाँ तक कि सामान्य तौर पर ऑनलाइन डिज़ाइन कोर्सेज और विशेष तौर पर एनीमेशन डिज़ाइन कोर्सेज की शुरुवात हो भी चुकी है. एनीमेशन क्षेत्र में कुशल युवाओं की बढ़ती मांग की वजह से एनीमेशन के ऑनलाइन कोर्सेज उन युवाओं के द्वारा ज्यादा तलाशे जा रहे हैं जो एनीमेशन क्षेत्र में रोज़गार की तलाश कर रहे हैं (Ferdin, 2019, July 12). कुछ रिपोर्ट्स के अनुसार ऑनलाइन कोर्सेज के दामों में भारी गिरावट भी देखी गयी है (Woodley, 2004). इस थीसिस ने ख़ास तौर पर एनीमेशन जैसे उन ऑनलाइन कोर्सेज़ की आव्यशकता की पहचान की है जिनमें गूढ़ ज्ञान निहित है (Belas, 2017). इस थीसिस ने इस क्षेत्र के साहित्य में उस अंतर को भी चिन्हित किया है कि ऑनलाइन कोर्सेस में पढाई के मूल्यांकन आधारित मॉडल की कमी है और साथ ही ऑनलाइन कोर्सेस के मूल्यांकन के लिए एक नया मॉडल भी प्रस्तावित किया है. इस थीसिस में प्रस्तावित मूल्यांकन मॉडल में 6 चरण हैं. इस मॉडल की शुरुआत इ लर्निंग के प्रति रवैये के मूल्यांकन से होती है, यह इ लर्निंग प्लेटफार्म डिज़ाइन की ओर प्रारंभिक प्रतिक्रिया मापने की प्रस्तावना करती है, लर्निंग प्लेटफार्म के सुविधाजनक इस्तेमाल का आंकलन करती है, यह इ लर्निंग प्लेटफार्म पर पढ़ते समय और उसको गंभीरता से समझते समय पढ़ने वाले के इसके प्रति रुझान का आंकलन करती है, पढाई के दौरान पढ़ने वाले के अनुभवों को मापती है और अंत में पढ़ने वाले ने क्या सीखा इसका मूल्यांकन करती है. इसके बाद प्रस्तावित मॉडल का इस्तेमाल किया गया ताकि पढ़ने वाले के रवैये, व्यव्हारऔर प्रयोगात्मक शिक्षा के नतीजों का पता लगाया जा सके.

पढ़ने वाले के रवैये का आंकलन 482 प्रतिभागियों वाले 20 बायपोलर एडजेक्टिव्स के साथ सिमेंटिक डिफरेंशियल स्केल्स (GSR) द्वारा किया गया और यह पाया गया कि पढाई के ऑफलाइन और ऑनलाइन माध्यमों के प्रति पढ़ने वाले के रवैये में अंतर है. अगले इ लर्निंग प्लेटफार्म को इसके इस्तेमाल में होने वाली परेशानियों के साथ बनाया और विकसित किया गया. प्रतिभागियों को इसके लैब एक्सपेरिमेंट के लिए बुलाया गया ताकि इस प्लेटफार्म के इस्तेमाल को परखा जा सके. इस इ लर्निंग प्लेटफार्म के इस्तेमाल के दौरान गैल्वेनिक स्किन रिस्पांस और व्यावहारिक डाटा जमा किया गया, इसके अलावा प्रयोग से पहले व बाद में प्रतिभागियों की कला में कुशलता के नमूने भी जमा किये गए. खोज में

सामने आया कि इ लर्निंग प्लेटफार्म के इस्तेमाल में आयी मुश्किलों ने प्रतिभागियों के इस प्लेटफार्म के प्रति झुकाव और इ लर्निंग एक्सरसाइज के नतीजों को प्रभावित किया. अभी तक इ लर्निंग मॉडल्स के मूल्यांकन को ले कर मुखर रूप से बात नहीं की गयी थी कि लर्निंग कंटेंट के साथ ऑनलाइन लर्निंग प्लेटफॉर्म्स की गुणवत्ता का मूल्यांकन भी होना चाहिए. इस थीसिस में प्रस्तावित मूल्याङ्कन मॉडल इस दिशा में पहला प्रयास है.

इस थीसिस की खोज यह रेखांकित करती है कि किस तरह इ लर्निंग वेबसाइटस का प्रयोग वेबसाइटस द्वारा पढ़ने वाले के सीखने की क्षमता को सीधे तौर पर प्रभावित करता है. इस थीसिस की खोज इ लर्निंग प्लेटफॉर्म्स का मूलयांकन अलग तरीकों से करने की आवश्यकता पर ज़ोर देती है क्योंकि मूल्यांकन के मौजूदा तरीके लर्निंग्स और लर्निंग मीडिया पर निर्भर हैं.

कुंजी शब्द (Key word): ई-लर्निंग, इवैलुएशन मॉडल, इन्फॉर्मेशन सिस्टम डिजाइन (आइएसडी), एचसीआइ, यूजेबिलिटी, यूजर एक्सपीरिएंस डिजाइन.

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GLOSSARY

Animation	Animation is a method of creating moving pictures through the illusion of movement by a successive display of hand-drawn or computer made images. The images could be 2 dimensional (length and breadth on paper/screen) or 3 dimensional (length, breadth and depth on paper/screen) thus giving the name 2D and 3D animations.
Attitude	A belief or feeling about something or someone. In the context of learning, it is the predisposition towards the medium of learning, like the predisposition towards e-learning, the person mediated traditional learning, etc.
Behaviour	The way in which one reacts. In the context of e-learning, it is the reactions towards the e-learning medium, the e-learning content or any of the steps involves in the process of e-learning.
Cell Animation	Animators drawing by hand on the cell or acetate sheets, multiple drawings for each frame of the animated movies and feature-length film is known as Cell animation.
Cognitive Load	Cognitive load is the amount of working memory used. In the context of e-learning, the working memory can be used by either the content of the learning or the e-learning platform itself.
E-learning	E-learning or electronic learning is electronically mediated learning where 'E' stands for 'Electronic'. E-learning is an overarching term for all different formats of learning where electronics has a role. The usage of storage devices like CD, DVD, VCD, cloud, etc., or audiovisual medium (multimedia) internet, intranet, satellite broadcast, interactive TV, websites, computer, tables, phones, etc. Literally, any electronic media

	used in the process of delivery of learning comes under e-learning.
Gestalt Psychology	A movement in psychology which studied perception in terms of the 'whole' rather than its constituents.
Human-Computer Interaction	Human-computer interaction or HCI in short, is the field of study that studies how human interacts with computers and how computers should be designed to match the human capabilities and needs. In the context of e-learning, HCI discipline and its theories would naturally become relevant along with learning theories as the interaction with the computer as well as the learning content together determine the learning efficiency.
Instructional Design	Instructional design is the process of planning, designing and producing the learning content. Online courses, instructional manuals, simulations, exercises developed for print or online, web-based program or video tutorials, all come under instructional design field.
Interaction design	Interaction design is the process of designing the interaction between the human and computer. The focus of design could be efficiency, visual delight, engagement, learnability etc. depending upon the type of interface and the type of user.
Learnability (usability)	Usability metrics include learnability along with efficiency, effectiveness, ease of use tec. As one of the ways to measure the usability of an interactive system. The 'learnability' aspect of usability attempts to measure the design quality of the interactive system because of which it can be learned easily by the user.
Learnability (learning)	In the context of learning, 'learnability' is about the quality of the content because of which learning can happen easily. It is about how to design the learning content such that it can

	facilitate better understanding, retention, and application of the learned content.
Learning Outcome	Learning outcome is the end result of any course or training. The learning outcome can be evaluated based on performance of learning post-learning exercise and a difference between pre-learning performance and post learning performance can be used to assess the quality of the learning content and learning media.
Offline learning	In this thesis, offline learning implies learning where no electronic media is used. It is used to imply traditional, instructor-led, classroom-based learning.
Online learning	In this thesis, online learning implies learning where electronic media is used. For experiments in this thesis, online learning has been used to mean specifically learning through a live website and not stored content on the computer.
Semantic Differential Scale	Semantic Differential Scale is a seven-point rating scale used in this thesis with bipolar adjectives on two ends of the scale. The respondents mark any of the 7 markers on the scale showing distance from the two opposite adjectives on two ends of the scale. This scale has been used to measure the attitude of learners towards the learning media.
Skill	Skill is the expertise to do some meaningful act of profession. In this thesis for the experiments that validate the proposed e-learning evaluation model, skill has been used to mean the competency of delivering a sketch in proportion and scale by the learner of the animation course.
Tacit	Tacit means what can be understood without being stated. Tacit knowledge forms a substantive part of the design profession in general and animation design profession in particular where a piece of knowledge is used during the professional practice and is appreciated but cannot be

	explicitly stated or taught in theory. Often thus requiring the need to learn by practice, reflection, and imbibing.
Usability	It is the quality of an interactive product because of which it is fit to be used. Ease of use, efficiency, effectiveness, learnability, and memorability are some of the parameters that are used to measure usability.
Usability Testing	Testing with the users of the interactive products like websites, mobile phones etc. to understand the extent to which the product is understood, easy to learn, easy to use, etc. This testing of the 'usability' of the product determines the fitness for use by the users of the product.
User experience design	The process of designing for the experience of the users of a product based on its interactivity, its emotional experience, its aesthetics, etc. While usability focuses to match the cognitive model of the user, the user experience aims to fulfil its affective and aesthetic needs.
Visceral Reaction	Visceral reaction is a gut feeling or an instinctive response to a stimulus or an experience. An initial response towards the look and feel of the e-learning website may influence the actual learning behaviour and the learning outcomes of the learner.
Vocational Courses	Vocational courses refer to different forms of courses designed to cater to specific needs of a career. Often the goal of a vocational course is to prepare an individual to directly suit the needs of industry. An example in the context of this thesis is online animation courses which are created to meet the needs of the growing demands of the animation industry.