DEVELOPING CONNECTIVISM LEARNING IN SOCIAL LEARNING PLATFORM USING ADDIE INSTRUCTIONAL DESIGN MODEL

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ABSTRACT

The aim of this study is to develop connectivism learning model that fits to social learning approach by using ADDIE instructional design. This model answers the need of learning model which can be implemented in social learning platform or in networked environment for general. To develop the model, ADDIE instructional design is used as phases of development process. This process involves analyze, design, development, implementation, and evaluation. This approach is considered as the most general model to design instruction, which can be implemented in varried of purposes. The participants of this study were 77 students of Educational Technology department of State University of Malang studying photography course. The quantitave analysis data of quesionnaire indicated that the Connectivism model was found to be adaptive and acceptable by the participants. The model received moderately positive acceptance from participants, and able to encourage collaborative activites through instructional process. The participants tend to be more confident to open the discussion or to share information and explore argumentation or suggestion. The process engaged the students to perform problem solving skills and collaborative work, which these performaces were not found on direct instruction in the classrom.

Keywords: Connectivism model, ADDIE, Contribution Index (CI), Content Richness (CRs)

INTRODUCTION

Social learning has traveled widely in the context of digital learning theories, it serves as a basis of understanding to understand how new knowledge being constructed. Learning theorist and scienctist have questioned and researched this paradigm to ensure how learning can occur in the context of network mediated learning. Although many theories advocate the importance of social interaction in influencing learning and performance, empirical evidence is relatively few (Chung & Paredes, 2015). Particularly, when learning happens in the unstructured learning environment among wide range area of students.

A theory that is proper to describe how learning occur in networked environment is social cognitive theory. Piagetian socio-cognitive supports this idea that learning is generated from cognitive interaction and conflict, between a person and the environment. Learning activites should facilitate the process of assimilation, accomodation, and equilibrium within participants. This process will stimulate the reconstruction of conceptual structures and understanding (Lai, Lei, & Liu, 2016).

A central tenet of most learning theories is that learning occurs inside a person. Even social constructivist views, which hold that learning is a socially enacted process, promotes the principality of the individual (and her/his physical presence – i.e. brain-based) in the learning process (Siemens, 2005). Learning is a social process of progressive knowledge acquisition that is shaped by individuals and their interaction with others who can contribute new ideas, opinions and experiences (Rosen, 2010; Chung & Paredes, 2015).

Educators have pointed out that elaboration processes are necessary for meaningful learning, which emphasizes the integration of new knowledge into existing knowledge (Novak, 2002; Kalyuga, 2009; Zheng et. al, 2014). The importance of elaboration is also supported by the generative model by Wittrock (1989), who indicated that new information should be meaningfully related to prior knowledge to generate connections between the informing information and memory representations in order to retain new information (Zheng et. al, 2014). In that case, educators need to formulate a model which can facilitate students in high level of collaborative learning and knowledge elaboration. This study focuses on developing systematic process of instruction, which the model called connectivism instructional model.

In 2004, Siemens launched the theory of Connectivism Learning based on a critique of previous mainstream learning theories synthetically labelled as Behaviourism, Cognitivism and Constructivism (Siemens, 2004; Pettenati, et. al., 2007). According to Siemens (2005), "learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing." (Trna, 2013).

Connectivism is a theoretical framework for understanding learning. In connectivism, the starting point for learning occurs when knowledge is actuated through the process of a learner connecting to and feeding information into a learning community (Kop & Hill, 2008). Knowledge is simultaneously seen as a commodity that can be managed and sold (in digital libraries of e-books and online journals) and as a social activity, a commons within which knowledge flows as people share and refine ideas (Bell, 2011).

METHOD

In order to meet the growing demand for quality online education, a course development model that provides a common framework for consistency, design, pedagogy and content can be very effective (Puzziferro & Shelton, 2012). This study was conducted through reliable methods of instructional development model, ADDIE. As ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation, the process are modified according to the needs and charactheristics of the subject of study and participants.

The model is choosen based on these folowing criteria:

1. ADDIE is the most common used method to develop instructional model
2. ADDIE is core of many instructional design method
3. ADDIE has high flexibility to adopt for many purposes, such as developing instructional model and materials
4. Using ADDIE as the method to develop instructional model leads to create effective instruction, because ADDIE has systematically process that can be explored according to the needs and characteristics (Branch, 2009)

This study involves 76 participants of of Educational Technology undergraduated

students, State University of Malang. The course that is choosen as subject study is photography, particularly on photo exhibition topic. The topic is choosen because the type of the selected content is dynamic and evolving. This content facilitates the participants to freely develop creative thinking ability.

The first step on implementation phase is media validation by an expert who has experienced to develop instructional model and media. The validation by expert is conducted to review the suitability of the choosen plaform with the characteristics of participants. Media experts will validate the following aspects: 1) the appearance and navigation of platform, 2) a draft presentation of information, 3) tools availability, and 4) accessibility. Variables above that exist on the course are used as indicators of learning environment quality. As in field trials, the aspects that are measured iclude: 1) instructional plan, 2) learning materials, 3) learning environment interface, and 4) learning activities.

Quantitative data is used in this study, and collected through questionnaires (close-ended). The likert's scale is used to describe participant's perceptions regarding the use of developed model. Processing of data for validation test media experts is:

$$P = \frac{X}{X_i} x100\%$$

Index

P   : percentage (%)
X   : expert's score
X_i : the maximum possible score from expert's review

$$P = \frac{\sum X}{\sum X_i} x100\%$$ ιta from field trials are as follows

Index

P   : percentage (%)
$\sum X$: sum of score from participants
$\sum X_i$: the maximum possible score from all participants

The results from media validation and field-testing are compared with the following eligibility criteria bellow.

Table 2. *Eligibility Criteria for Instructional Model (Sugiyono, 2008)*

Category	Percentage	Qualification	Equivalent
4	86% - 100%	No revision	High eligibility
3	76% - 85%	No revision	Eligible
2	56% - 75%	Need revision	Less eligibility Lack
1	< 56%	Must revised	eligibility

Furthermore, in the context of social learning, there are two concepts that are very essential, especially when measuring the success of a model in enhancing the ability of participants to collaborate in instruction. The concepts are Contribution Index (CI) and Content Richness score (CRs). Contribution index (CI) is a term used to measure level of individual participation in social learning context (Gloor et. al, in Chung & Paredes, 2015).

The second term is content richness score. Content Richness score (CRs) is a measurement of the level of involvement or meaningful contribution of individuals in learning activity among participants, and as a evidence of progress in learning (Chung & Paredes, 2015). Both of these variables will be measured to see the reliability of the model in terms of results. The calculation of the contributions index can use the following formula:

$$CI_i = \frac{\sum s_i - \sum r_i}{\sum s_i + \sum r_i}$$

Index:
CI_i : contribution index score
$\sum s_i$: the total of messages sent by i
$\sum r_i$: the total of messages received by i
(Chung & Paredes, 2015:248)

If the learner mostly received messages, then his or her contribution index will be close to -1. On the other hand, if the learner mostly sent messages, the contribution index will be close to +1. In terms of social learning we are looking for highly interactive dialogues. A contribution index near to 0 is indicative of a balanced dialogue of the learner with his or her team colleagues (Chung & Pardes, 2015:248).

Table 3. *Contribution Index Criteria*

Interval	Description
-0,4 to -1	The learning mostly receive messages
+0,4 to +1	The learning mostly sent messages
-0,3 to +0,3	The learning successfully create interactive dialogues or engagement in learning activity

As for calculating the richness Content Scores (CRS), we can use the following formula:

$$CR_q = \frac{\sum_{i=1}^{n} mc_i}{n * \max(mc)}$$

Index:
CR_q : Content Richness Score
mc_i : the message content value of the message i
n : the total number of messages sent by q
Max (mc) : the maximum possible value of message content quality
(Chung & Paredes, 2015)

Table 4. *Level of Learner's Engagement to Learning Based on Content Richness Score*
(Chung & Paredes, 2015)

Interval	Description
0	level of contribution richness to the discussions was non-existent
0,1 to 0,3	Less meaningful contribution
0,4 to 0,6	Average meaningful contribution
0,7 to 1	High meaningful contribution

Content Richness score (CRs) range is at 0 to 1. If a learner's CR score is 0 that means that his or her level of contribution richness to the discussions was non-existent. On the other hand, a CR score of 1 means a highly meaningful participation and engagement in course and group discussions. The importance of the CR score for this study is that we can measure 76 learner's performance is directly related to his or her level of engagement in a social learning environment, and this metric can help us to determine if there is such relation between these two indicators (Chung & Paredes, 2015:248).

Table 5. *Content Categories and Their Assigned Weights, with Examples* (Chung & Paredes, 2015)

Weight	Content category	Message example
0	Empty	"Alright, see you later!";"Bye,"; "Thanks."
1	Team Building	"Excellent work, team!"; "The last task has really got me enjoying this group work."
2	Dissemination	"I submitted the last version of our report!" "The deadline has been extended."
3	Coordination	"Let's meet tomorrow at 7pm," "I can write this section of the report. John, can you do the other part and Emily integrate it all?"
4	Collaboration	"Dear Peter, I think your answer to the question is correct. However, I found this article in which the authors analyse the issues from the different perspective. Please consider also..."

RESULTS
Review of Media Experts

In this study, media validation is an activity to validate eligibility of course platform by media expert. In this validation, media expert evaluate course based on it's tools quality, and the quality of the material used. The review from media expert assesses whether the course being used can facilitate the course of the model or not.

Media expert in this study is a lecturer of educational technology department, faculty of educational science, Universitas Negeri Malang. The media expert has academic background in communications media, and has some experiences in research on instructional media development. The instrument used to collect data from media validation is enclosed questionnaire suggestions and comments regarding the product.

Table 7. *The Results of Media Expert Assessment According to The Platform (Schoology)*

No.	Criteria	Max score.	Real score	%
1)	Interface and navigation	15	13	87%
2)	The design of information presentation	20	17	85%
3)	Completeness of supporting models	10	9	90%
4)	Accessibility	10	8	80%
	Score	55	47	85,45%

Based on calculations, the percentage of the media validation is 85,45%. If converted into the criteria of feasibility, validation result of this media is at a decent level and do not need to be revised. Some notes can be given by the validator related to the feasibility of SLP platform can be summarized in the following points :

1. Adding support material or sample from lecturers own work
2. If possible, add media audio (podcast) for independent learning
3. Platform and course developed already user friendly, just need to add material or the work of a lecturer of the course
4. Students should be motivated to be more accustomed to in the chosen platform

Field Testing

Field testing is focused on the reliability of the model and feasibility model when implemented on population level. The field-testing is conducted on a total of 76 students, and are divided into two classes (offering), A and B. This study involves 76 students of the Department of Educational Technology, which are joined on Photography course. The participants carried out activities on connectivism models with the guidance of the researcher. And the next week, they are asked to complete a questionnaire related to the feasibility of the model used in online activities . Data received, only totaling 53 test participants.

Table 8. *The Results of Field-Testing*

No.	Aspects	Max. score	Real score	%
1)	Instructional program	1590	1228	77,23%
2)	Instructional materials	2120	1717	80,99%
3)	Learning environment (course)	1325	985	74,33%
4)	Learning activity	4240	3240	76,41%
	Score	9275	7170	77,30%

Based on the results of questionnaires from 53 participants, it can be produced the following data:

Table 9. *Eligibility Criteria for Each Aspect and Average Overall Model Tested*

No.	Aspects	Percentage	Criteria
1)	Instructional program	77,23%	Eligible
2)	Instructional materials	80,99%	Eligible
3)	Learning environment (course)	74,33%	Eligible
4)	Learning activity	76,41%	Eligible
Model Connectivism		77,30%	Eligible

Based on calculations, the percentage of the field testing of the connectivism instructional model by 77.30 % . The whole point statement in questionaire is a kind of positive statements, so the participants are not confused in measuring attitudes towards the statement. Likert's scale is used, with a range of 1 to 5, starting with an attitude does not agree to strongly agree.

Contribution Index

Reaffirmed, along with the collaborative activities such as reading a post learner interaction else has value for learners who post and increase the desire of learning , is said to be a meaningful cooperative activities (Graham et al , 2001, in Dixon , 2010: 2) . Therefore it is important to measure contribution index value. The contribution index value will be between the range of -1 to +1. If participants mostly receive a message, it will approach its contribution towards -1. Conversely, if participants tend to send a message mostly then the index value will be close to +1 (Gloor in Chung and Paredes, 2015: 248). At this connectivism model development, which the goal is to create high interactive dialogue, which is approaching the number 0, or it is in the range -0.5 to +0.5 .

Contribution index data of participants can be presented in the following frequency table bellow:

Table 10.*Frequency Table of Contribution Index*

Interval group	Frequency
-0,4 to -1	2
+0,4 to +1	51
-0,3 to +0,3	9
Neither sending nor receiving message	15
N	
76	

Table 11.*Contribution Index Criteria*

Interval	Description
-0,4 to -1	Tends to mostly receive message
+0,4 to +1	Tends to mostly send message
-0,3 to +0,3	Successfuly create interactive dialogue

As the table above display, in the practice of connectivism model, the model shows us that only 2 participants were more likely to receive a message than to send a message. 51 participants send message more than the frequency of receiving messages. 15 subjects are not active in learning, with a lack of interaction and communication. And 9 participants are expected to successfully build an interactive dialogue in the environment, and guide the community (environment) to the learning objectives.

Nine participants are considered successful in establishing an interactive dialogue in a predictable environment. All of them are the chairman of each team in the exhibition, since there are nine teams. Every leader of the teams has the responsibility to lead members to perform

tasks and obligations. It is hoped that the model developed is capable of displaying 70% of participants were classified into criteria try managed to build an interactive dialogue. On this study, the percentage level of this criteria is: $(9/76)*100\% = 11.67\%$.

Content Richness Scores (CRs)

In the settings where social learning is implemented in a web platform, it is also taken into account the strength of messages that appear in the interaction which was built by the participants. From the development model, we tabulate the number of criteria the following message:

Table 12. *Types of Messages That Appear on The Entirety of Participants*

Empty (0)		Team Building (1)		Dis1semination (2)		Coordination (3)		Collaboration (4)	
n	x	N	x	n	x	N	x	n	x
133	0	1	1	17	34	98	294	21	84
270									

Table 13. *Activeness of The Participants Based on The Content Richness Criteria*

Interval	Descriptions
0	Zero of contribution
0,1 to 0,3	Less of contribution
0,4 to 0,6	Average of contribution
0,7 to 1	High contribution

From the data in the table above, we can present frequency table below.

Table 14. *Frequency Tables of Index Contributions*

Interval Class	Frequency
0	23
0,1 to 0,3	8
0,4 to 0,6	23
0,7 to 1	8
No activities (-)	15
N	76

Based on the level of content richness, the research found out that among the participants, 15 of them are unable to make any interaction or even respond to anything. 23 participants do not have contribution, despite the message or comments. 8 participants have a low contribution, 23 participants have moderate contribution. And last, 8 participants have a high contribution in achieving learning process (discussions). The criteria that contribute starting from the third criterion or in the range of 0.4 to 0.6, and 0.71 to 1. Thus, participants who have contribution are particularly 29 participants.

In a learning community, 70% of the participants are expected to actively contribute, starting from average contributions (mean). On percentage, the number of participants that contributed positively is (29/76)*100%= 37.66%. The fact that the participants whose contribution are still half of the amount expected are to be related to the quality of the developing models. And also, the possibility of intervening variables on this development are still existed.

The variables that may cause of the lack of contributions from participants are personal characteristics, or their role in the class. It may be the actual social relations in the environment or in the classroom. To see this relationship, it could also be seen to provide instruments sociometry for the participants. So the hypothesis that the value of the contribution that less is indeed derived from the characteristics of the actual environment.

Characteristics and Analysis of Connectivism Model

a. Instructional Design

1) The integration between the goals and curriculum

Learning objectives in this development is manifested in units of basic competencies and more specifically into several unit objectives. Instructional goals and unit-objectives are constructed based on the principle of SMART (specific, measurable, attainable, relevance, and timely). Curriculum Development on Photography course should be adaptive to the state of the art in photography. For example, the previous curriculum did not include a Mirrorless Digital SLR (single lens reflect) camera as a lesson, but to the current curriculum, the material is integrated through experiment and discussion material.

Instructional goals and objectives of the last subject can be described in the following table

Table 15. *Instructional Goals And Objectives That Used In This Study*

Goal	Objectives
Creating the concept and display a photo exhibition	• Understand the benefits and objectives of the exhibition • Analyze the components of the exhibition management phases • Analyze the exhibition equipment • Exhibit photo curation • Creating a photo exhibition design

In essence, photography exhibition lesson is a substance that is both theoretical and conceptual. However, the version of the curriculum used at this time, the material must exhibit management to the implementation of a real art exhibitions. Therefore the delivery of the material can be measured objectively.

2) Activities and Assessment

Learning activities in online learning mode is embodied in a plan called the learning activity rubrics. The model is developed in accordance with the principle of connectivism, which in principle it makes the participants to create personal learning network. For the assessment method in the

development, project based assessment is used to measure learning achievement either individually or in group context. The assessment process is called a curration process.

In the curration process, all of photograph are discussed together with the participants. It was measured based on several aspects, such as exposure quality, technical quality, the quality of the elements of art, and the clear message of the photograph. Furthermore, partcipants and researcher selected photographs of each theme that will be exhibited. The photos have been taken before the photography exhibition lesson, therefore the photography exhibition is the final lesson that practice all the skill that have been taught previously.

b. **Learning activity**

In this section, we discuss the theoretical and the field findings regarding the results of the development model of connectivism learning. The discussion will be carried out at each stage of connectivism developed as a model.

1) Awareness and receptivity

In the context of social learning network, the roots of motivation to learn the communication and maintaining relationships (Dwyer et.al, 2007). There are two goals of awareness and acceptance stages, including: a) to trigger interest and motivation to learn through studying the relationship between the participants; and b) to prepare students to become familiar with the platform, such as tools, layout, and activity. Direct instruction is used to introduce students to the learning platform, this way, the platform intrigues students to be more motivated and curious about the learnign process.

Instruction is delivered by presenting the display and use Schoology to the participants. Participants show high curiosity to the platform, because this is the first time that the participants of this study implement online learning. After the introduction session of schoology, the subject of the trial introduced the registration process and enroll in the course Schoology. This stage is still in the process of direct instruction. In this stage of introduction, some test subjects has been directly registered in the course developed without any order.

Furthermore, the initial process of learning begins with the test subjects fill out a document called learning contracts. Learning contract is intended to predict the subject of the trial regarding the terms of its readiness to follow the model of learning. Learning contract is an agreement between the participants and instructors, and sometimes include parents (guardians), created for measuring the seriousness of participants in the study.

Learning contract aims to the following:
a) Identification of the content that will be studied
b) Identification of the methods and strategies that will be used to study the content
c) Identification of learning resources to be used
d) Identification of concrete examples of sources that will be demonstrated
e) Identification of how examples will be demonstrated by participants learn

This form is presented through Google Forms, making it easily accessible to be presented and analyzed. The core part of the learning contract is made to identify

the plan of the participants contributing in the study. Based on this form, it can be seen how the attitude of the participants in implementing the learning patterns later. Based on the planning, learning contract works out to be a predictor for successful learning purposes, particularly for learning with online mode.

2) Stages of learning experience

Grouping occurs at the beginning of the learning process. It is intended to build participants's responsibility and a sense of belonging among peer group. The discussion forum is not only carried out by small groups, however, but also it is performed well in general forums or in a classroom environment. The small group that is intended for this discussion is based on the standard of photography exhibitions, so there are six teams (groups) to organize an exhibition of good and well-planned.

This meant that this study facilitates participants to establish the connection relationship information sharing, through the model of connectivism learning. Activities can be interactive discussion when there is an administrator or discussion leader. Deficiency that occurs is in the large group forum, the absence of admin class, so the instructor must hold this role as well. However, in each of team, the admin group plays an important role to guide participants to get into the existing problems.

To increase the meaningfulness of each of individuals, the participants are instructed to actively interact in the respective teams. Were it not a significant communication, each participant tries to present theirself in the interactions that occur within the team. For example by replying to the message by way of a joke or just a blank message. To improve the interaction, similarly, the

test subjects are instructed to not hesitate in replying, mentioning, or tagging the other participants.

3) Contribution and involvement

Interactions that occurs in the course can be a predictor as outcomes on the implementation of connectivism model. Cooperative and collaborative side in this model are important in learning in a very broad network, where the network is a learning environment that is contained in the actual environment. One impact is most often arise from the use of information and communication technology is the creation of a "groupthink" where each component in the group collaboratively involved in the process of generalizing the idea , using the benefit of the knowledge gained from the proceedings on the internet (Weick in Cliff et. al, 2011). In online learning, this is the main objective that must be improved. Connectivism provide considerable opportunities to help participants to improve its ability to self-learning collaboratively or referred to as self-directed learning.

There are two main objectives in this stage, the first is to develop a positive perception within the group by increasing the intensity of internal discussion groups, and the second is to increase solidarity among the members of the group. Results from this stage will determine the success of a trial subject in constructing knowledge and building a social aspect to the environment. The more test subjects interact, such as comment, post, tag, or share, the more information that is available and increasingly extensive learning resources it has.

To build up the intensity of the discussion, each participant provides a reference to group or class community.

Not all participants donate reference material, it is predicted to be the influence of the lack of initiative of the participants in the exploration of the material. A bit of a population who have been steering discussion or contributing useful information to solve the problems presented to each team. To maximize the interaction, one is to schedule an online meeting in real-time. Through scheduled properly activities, automatic attachment between members of the team by itself will increase. Especially if the assessment is based upon cooperation and performance of the group, so that each individual has an important role in grading each group. Connectivism is made as part of the learning environment to share information and collaborate, rather than as a source of learning, but rather the place where brings together a range of information into a single unit.

4) Reflection and metacognition

The last stage of the connectivism model is an activity reflection and metacognition. The essence of these two activities together are with the confirmation and evaluation activities on conventional learning. This activity is conducted to determine the reliability of the models developed, how it affects the achievement of learning objectives. The shape of the reflection and metacognition activities must be adapted to the type of learning objectives that are expected, as well as evaluation principles.

Based on the learning objectives, then the form of reflection and metacognition in this development is through the dissemination of the results of the discussion of each team in the exhibition to a whole other study members. It is intended that the confirmation process between the participants learn first, before eventually will be evaluated along with the instructors (eg lecturers). This process, in development, was not able to be fully implemented in the online mode, so it must be equipped with face to face meetings.

DISCUSSION

Connectivism model that is developed is applied in a social learning platform, called Schoology (http://schoology.com). This platform is chosen due to several considerations. Which the most important fact is that Schoology integrates between learning management system and enterprise social network. That is, in Schoology, there are two activities simultaneously, learning management and social media. The first thing that Schoology offers is facilities which are like Learning Management Systems (LMS). Such as the management of learning materials, attendance checking, discussion forums, chatting, task uploading, blogging, student analytics, quizzes, and grading. The facility is directly given to the instructor who enroll in Schoology platform, and based in the needs of the instructor, the facility can be upgraded to a more complete and perfect form. Secondly, in terms of enterprise social network. Schoology design is almost like interface of Facebook. Where the navigation and layout closely resembles the design of social media the world. In terms of social media facilities, Schoology facilitates collaboration among participants in the class, group, and even schools.

A benefit of Connectivism is that, as Cormier (2008) recommends, it is allowing a community of people (working with learning technologies) to legitimize what they are doing. If Connectivism is mutable knowledge as it extends its network,

then it will behave like the knowledge and networks it describes in the theory (Bell, 2010). The critical weakness that is found along the development is that participants have a few of knowledge and comprehension related to the learning process, particularly on the specific steps that they have to perform. It is highly considerable to conduct a draft or a manual document that can guide participants to contribute to the learning process.

Connectivism considers learning as a process in which the role of informal information exchange, organised into networks and supported with electronic tools, becomes more and more significant. Learning is becoming a continuous, lifelong system of network activities, embedded into other activities (Bessenyei, 2008). The goal of connectivism is to build knowledge contextually among community. Therefore, high interaction and contribution are very expected occur in this process. To optimize connectivism as a learning process, it is also considered to apply behaviorism principles, such as providing rewards and punishments.

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