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# PERSONALIZED E-LEARNING IN HIGHER EDUCATION: A SYSTEMATIC LITERATURE REVIEW

**Jaka Suwita**

Computer Science Department, BINUS Graduate Program, Doctor of Computer Science.  
Bina Nusantara University, Jakarta, Indonesia 11480  
Information System Department,  
STMIK Insan Pembangunan Tangerang, Indonesia 15810

**Meyliana\***

Information Systems Department, School of Information Systems  
Bina Nusantara University, Jakarta, Indonesia 11480

**Achmad Nizar Hidayanto**

Faculty of Computer Science  
Universitas Indonesia, Depok, Indonesia 16424

**Harjanto Prabowo**

Management Department, BINUS Business School Undergraduate Program  
Bina Nusantara University, Jakarta, Indonesia 11480

## ABSTRACT

*Many methods have been developed to improve learning experience with computer technology. A special great influence of technology on the learning came with the rise of the web and mobile technology. Internet enables users to perform interaction and collaboration with each other for creating, organizing, and sharing knowledge using e-learning platforms. In this paper, we conduct the Systematic Literature Review (SLR) research method for the implementation of personalized e-learning in higher education. The paper presents a comprehensive view of the personalized e-learning concept in higher education. Our contribution is comprehensive information on the application of personalized e-learning in higher education, to improve learning quality, and the possibilities of use in practical.*

**Keywords:** personalized e-learning, personalization, higher education, systematic literature review

**Cite this Article** Jaka Suwita Meyliana Achmad Nizar Hidayanto And Harjanto Prabowo Personalized E-Learning in Higher Education: A Systematic Literature Review Instrument *International Journal of Mechanical Engineering and Technology* (IJMET) (10)(2), pp;1036-1047  
<http://www.iaeme.com/ijmet/issues.asp?JType=IJMET&VType=10&IType=2>

## 1. INTRODUCTION

The quality of learning process will have significant impact in the quality of graduate student in the higher education institution. E-learning system can increase the absorptive capacity of students from the material learned in class, enhance student self-learning participation and increase the quality of the study material being studied.

Therefore, student need more personalized learning to fit their learning need. The specific issues are: (i) what is learned, (ii) when, and (iii) how to learn it. Personalization of e-learning is an adjustment to environmental learning to meet the needs and preferences of each student [1]. The context of the e-learning personalization is how to identify material resources needed for students. The material resources can be selected from the most ranked learning styles to be studied, and other alternative is selected form a list of teaching material resources compiled based on learning styles [6]. Learning Design developed to produce recommendations for students, considering their preferences and abilities to motivate them, and consequently, improve efficiency and student honesty in every learning situations [16].

Understudy learning conduct is an essential factor in the push to the advancement of customized e-realizing with the goal that it can distinguish and react to understudy learning capacities [8]. Segments that normally assume a critical job in personalization are: (i) incorporated learning structure, (ii) learning model, (iii) customized learning situations, (iv) customized substance choice, what's more, (v) portfolio-based valuation [15]. Customized authoritative educational programs, finding examples of learning conduct to fabricate a progression of criticism and inspirational frameworks for the advancement of customized e-learning [9]

## 2. THEORITICAL FOUNDATION

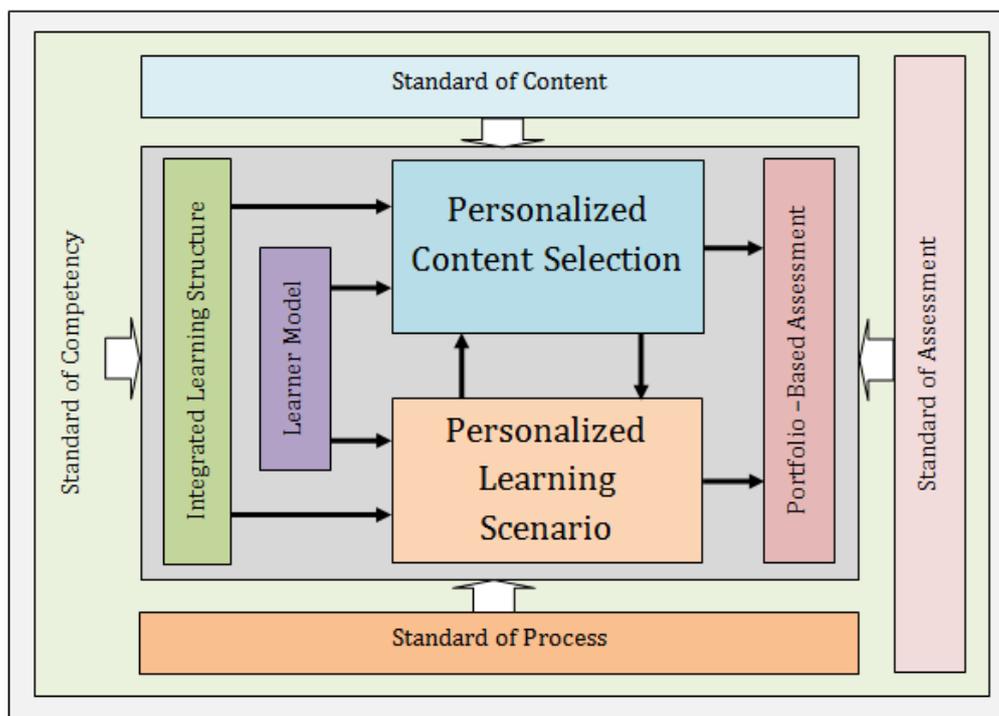
The independent learning method and learning habits are very much needed in online learning. The role of the learner holds a very important war and the key to the success of online learning. Therefore, an e-Learning system is needed that is able to encourage learners to play an active role. Personalization by utilizing ontology on web 2.0, which includes adaptive ability to the level of learner ability and collecting knowledge resources that support each other is needed so that the learning outcomes can be maximally achieved [2].

Personalization techniques such as preference modeling are important techniques needed in e-learning personalized content. However, in order to be more optimal in learning achievement, elements of sociology and psychology must be included, namely implicit knowledge of human behavior and social expectations in the process of taking [3]. Learning mode recommendations for curriculum compilation adjust learning for students who have very specific needs and not much time or patience to complete the topics they must learn [4].

In the process of designing an e-learning personalization system, the system design should focus on the following: (i) improve the learning abilities of learners from different cultural backgrounds, (ii) anticipate the problem of differences in educational values, (iii) anticipate differences in cultural education backgrounds, anticipate of differences in cultural communication, anticipate of differences in language use and also must consider individual learning students style [5] .

Personalization methods oriented to the knowledge model are needed with consideration to the speed and expertise of the learner participants, besides that the e-learning scenario must use two levels of personalization, namely the content of learning and the structure and personalization strategies that match the characteristics of the learners [7].

Figure 1. speaks to the customized e-learning engineering. In the improvement of customized e-picking up, learning content, evaluation gauges and procedure guidelines are required so as to make reasonable e-learning system for individual understudies.



**Figure1** Personalized E-learning Architecture [15]

In this paper, we will perform SLR methods to identify approaches, content and standards for personalized e-learning.

### 3. METHODOLOGY

Systematic Literature Review is a method used to do a complete literature review. There are three steps in the implementation, namely: the first stage of the introduction which covers the scope, determines the questions from the research. Next is the process of finding the source and keyword selection. And last is to determine inclusion and exclusion criteria to classify the types of research and extract data from the selected research for further exploration or review of the study.

Following the guidelines by [8], we present a systematic literature review (SLR) to identify on approaches, contents and standards of personalized e-learning .

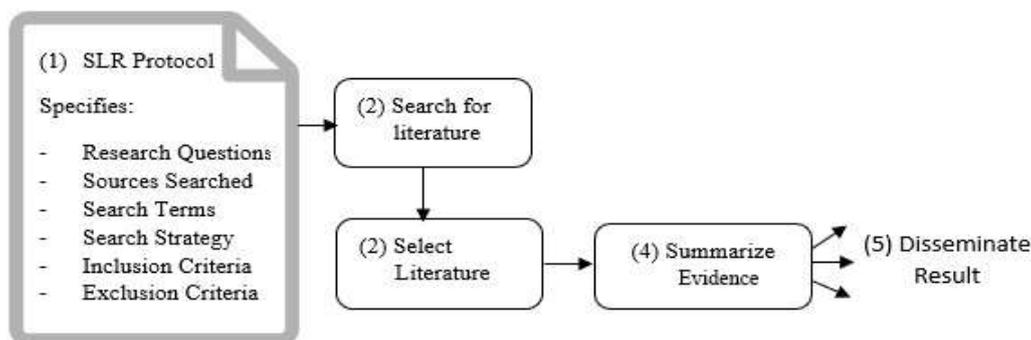


Figure 1 The SLR process in the domain of IT/IS [8]

### SLR Protocol

We specify SLR protocol for this research as follows:

Table 1 SLR Protocols

SLR Protocol	Description
Research Question	RQ1: what approaches are used to personalized e-learning in higher education? RQ2: what contents are used to personalized e-learning in higher education?
Sources Searched	DOAJ ( <a href="https://doaj.org/">https://doaj.org/</a> ) IEEEExplore Digital Library ( <a href="http://ieeexplore.ieee.org">http://ieeexplore.ieee.org</a> ) Science Direct ( <a href="http://www.sciencedirect.com">www.sciencedirect.com</a> ) Google Scholar ( <a href="https://scholar.google.co.id/">https://scholar.google.co.id/</a> )
Search terms	approach or personalization e-learning
Search Strategy	Step 1: Inserting keywords into search features in the digital library website. Step 2: Stating the total summary of searching using the keywords that appears as “studies found”. Step 3: Reading the title of the papers. When the title is not enough to identify the paper, then the abstract will be explored. On the off chance that the title and the unique suitable to the goal of research, at that point the paper will be downloaded for further investigation. The quantity of downloaded papers is called 'competitor contemplates.' Step 4: All the 'hopeful examinations' will be concentrated to see its significance to the targets of the investigation. The important papers will be utilized in this examination as the 'chose investigations.'

### 3.1. Literature search result

Literature studies examined 145 papers from all resources are fit to the criteria. From the 145 papers examined, there were 49 papers are chosen as competitor ponders dependent on related titles and edited compositions for research questions. After further examination, there were just 38 papers that could be utilized in this investigation.

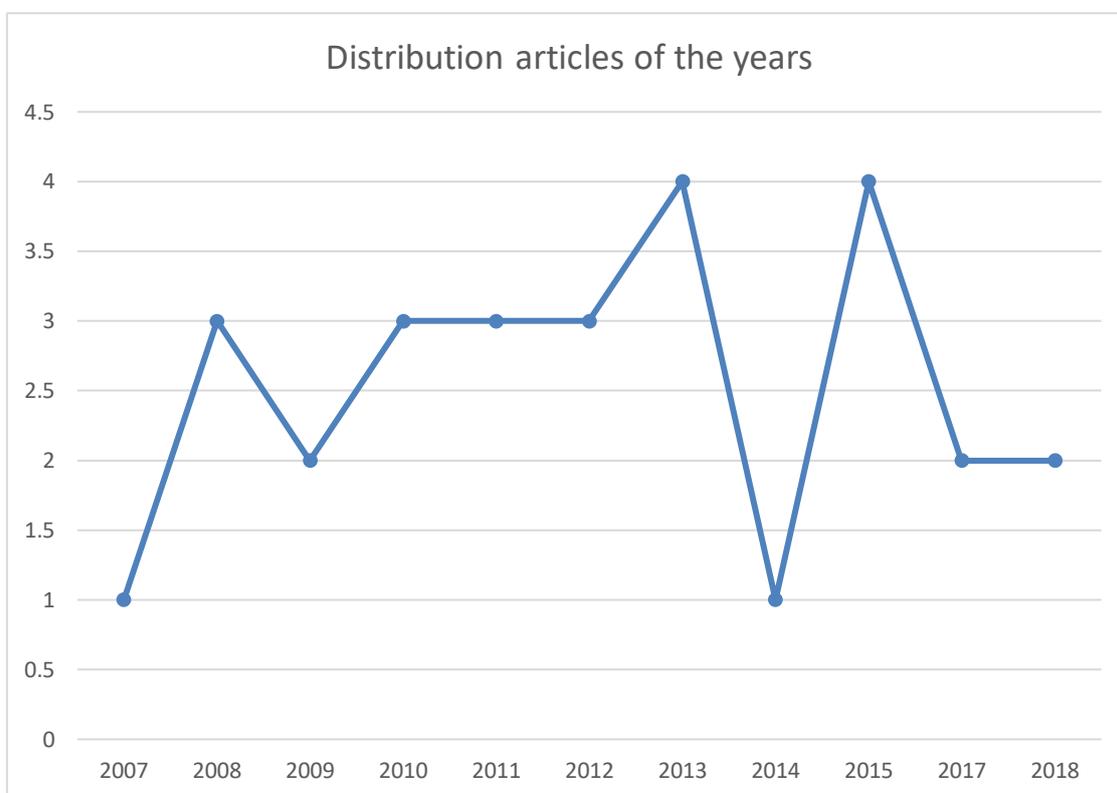
**Table 2** Data Extraction in Inclusion Criteria

Sources	Studies found	Candidate studies	Selected studies
Science Direct	96	21	19
Google scholar	117	15	17
IEEE Explore	16	11	1
DOAJ	4	2	1
<b>Total</b>	<b>145</b>	<b>49</b>	<b>38</b>

## 4. RESULT

### 4.1 Demographics

The data collection was limited to publications from 2007 to 2018 with 29 research papers collected and analysed. Figure 1 illustrates the incremental progress in the number of publications from 2007, then going down substantially in 2018.



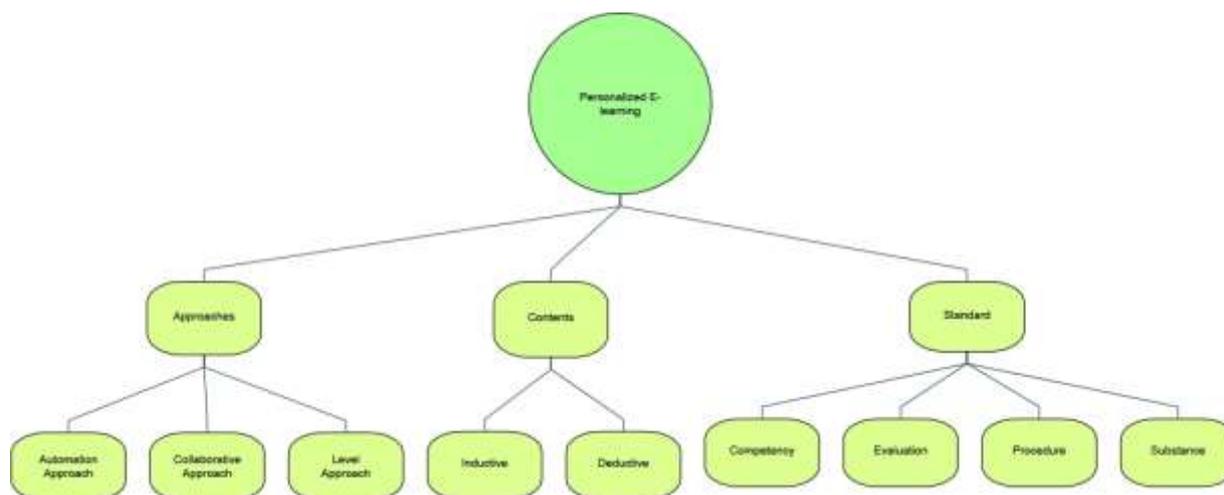
**Figure 1** Demographic and trend characteristics



**Table 2** Publication Sources

No	Title	Year	Type	No	Title	Year	Type
1	IMS LD ...[10]	2005	Jurnal	20	Review of ...[7]	2015	Jurnal
2	Personalization ...[2]	2011	Jurnal	21	An approach for ...[21]	2013	Jurnal
3	Research ...[3]	2009	Jurnal	22	Hybrid ...[22]	2012	Jurnal
4	Learning ...[11]	2014	Jurnal	23	An Ontological ...[23]	2008	Jurnal
5	Personalized ...[4]	2012	Jurnal	24	IDD Personalization ...[24]	2007	Jurnal
6	Understanding ...[5]	2008	Jurnal	25	Computers ...[25]	2013	Jurnal
7	An Agent ...[12]	2011	Jurnal	26	Computers ...[26]	2011	Jurnal
8	Learning ...[6]	2014	Jurnal	27	Expert Systems ...[27]	2012	Jurnal
9	Applications ...[13]	2017	Jurnal	28	Knowledge ...[28]	2015	Jurnal
10	Review of ...[7]	2015	Jurnal	29	Computers ...[29]	2010	Jurnal
11	Integration ...[8]	2018	Jurnal	30	On the Use of ...[30]	2016	Jurnal
12	A Web Mining ...[9]	2014	Jurnal	31	Constructing ...[31]	2007	Jurnal
13	A Semantic ...[14]	2008	Jurnal	32	Building ...[32]	2012	Jurnal
14	Personalized ...[15]	2015	Jurnal	33	Towards ...[33]	2010	Jurnal
15	Content ...[16]	2011	Jurnal	34	Personalised ...[34]	2015	Jurnal
16	Improving ...[17]	2015	Jurnal	35	Development ...[35]	2013	Jurnal
17	Artificial ...[18]	2017	Jurnal	36	An adaptive ...[36]	2010	Jurnal
18	Evaluating ...[19]	2009	Jurnal	37	Intelligent ...[37]	2008	Jurnal
19	A New Approach...[20]	2012	Jurnal	38	Personalized ...[38]	2005	Jurnal

From the literature review result, we categorize personalized e-learning methods from perspective: approaches, contents and standard. Figure 2 show the mind map of personalized e-learning.



**Figure 2** Personalized E-learning Mind Map

Below we explain the details of each approaches, contents and standard that represented in the mind map.

#### **4.2.1 Approaches**

The personalized e-learning approaches include:

##### *a) Automatic Approach*

The automatic approach is based on the actual behavior of students towards a system. This model built a smart e-learning environment, enable interaction between machine and students when using the system by learning student behavior [10].

##### *b) Collaborative Approach*

Collective showing style in class. Cooperative learning manages different people. Understudies must regard the capacities, aptitudes and commitments of different people in the gathering. There is a division of power between and acknowledgment of obligation among understudies for the activities of different members [10].

##### *c) Level approach*

Approach to personalizing learning scenarios based on two levels: The first level allows personalizing learning scenarios according to the personalization strategies that have been predetermined. The second dimension enables the instructor to choose personalization parameters and consolidate them adaptably to characterize distinctive personalization systems as indicated by course details [28].

#### **4.2.2. Contents**

Personalized e-learning content form dependent on the caught client profile, the e-learning framework could either naturally by the e-learning framework (inductive technique) or physically by the client (deductive strategy) customizes the substance to coordinate that client profile and adjust the substance to coordinate that client profile..

##### *a) Inductive technique:*

*Dynamic change or Recommendation:* the e-learning structure will subsequently alter its functionalities and its substance to arrange the customer profile subject to the customer profile.

*b) Learning:*

the e-learning structure make show that get the customer profile normally through account his scrutinizing precedents and relationship with the e-learning system.

*c) Deductive strategy:*

*Parameterization:* The customer physically sets his/her profile by setting his/her own special parameters or tendencies.

*d) Static Transformation or Recommendation:* The customer will physically set proposals and tendencies on how the e-learning structure functionalities and substance will be shown to him/her subject to the customer profile.

These inductive and deductive systems will be used as criteria to orchestrate the reviews on the personalization of both data and the learning substance [21].

### **4.2.3. Standards**

The standard of e-learning personalization built as a comprehensive guideline for improving e-learning.

The standards of e-learning personalization are as follows:

*a) Standard of competency*

Competency measures contain portrayals of the learning and abilities that understudies are relied upon to have on exceptional phase of their training. Competency principles give an educational programs, course and subject structure. As it were, skills figure out what substance and structure of learning will be conveyed[15].

*b) Standard of evaluation*

Standard of evaluation characterizes component and systems in surveying students' execution dependent on standard of competency. Evaluation ought to mirror the dimension of accomplishment students made toward every competency. Appraisal should empower advancement of portfolios that show advancement of students on explicit competency.

*c) Standard of procedure*

Standard of procedure clarify how learning procedure ought to line up with characterized learning structure in characterized competency. It creates explicit skills into learning structure and situation. In personalization, learning situation should take into record student's inclination, capacity, and character based on student displaying. It likewise imperative that learning situation empower adjustment procedure of the learning material personalization to every individual student [15].

*d) Standard of substance*

Standard of substance characterizes extent obviously and materials to be conveyed dependent on competency and educational modules. It contains of standard of learning materials and exercises that adjust to competency. It likewise progressed toward becoming establishment of substance store house advancement [15].

## **5. CONCLUSIONS**

The objective of the study is investigating the personalized approach of e-learning for higher education. In this Systematic Literature Review study, we conclude that e-learning personalization system design should be referring on the: (i) approaches, (ii) contents and (iii)

learning standards. These approach very necessary to be implemented, for creating more personalize learning to increase the quality of e-learning system. The understanding of learning style also enables learners more quickly understand the material being studied. We believe that the proposed personalized e-learning map will be a useful reference material for researchers and higher education institutions that develop products on learning technologies.

## 6. FUTURE RESEARCH AGENDA

From the Systematic Literature Review performed. We identify the components of the approach, concepts and standards of the personalized e-learning. There are many future research agenda on personalized e-learning domain can be considered. The study on the learning personalization that more focus on learning styles can be contributing to optimized e-learning process for better learning outcomes.

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