

Difficultness-Usefulness Pyramid (DUP) as New Method to Select Elements Prioritized in Management of e-Learning in Health

Heru Santoso Wahito Nugroho¹, Sahrir Sillehu², Handoyo¹, Suparji¹, Sunarto¹, Subagyo¹, Bambang Sunarko¹, Bahtiar³

¹Health Polytechnic of Ministry of Health in Surabaya, Indonesia; ²Institute of Health Science “Maluku Husada”, Indonesia; ³Health Polytechnic of Ministry of Health in Makassar, Indonesia

ABSTRACT

In today's information age, most health institutions have utilized information and communication technology in various organizational activities, one of which is e-learning in education for health workers. This study aimed to create a new method for selecting the elements of e-learning that are prioritized for improvement. The results showed that: 1) selected elements were learning design, handout, book, link to resources, discussion forum, chatting, assignment, feedback, quiz and survey; 2) selected attributes were difficultness and usefulness; 3) the priority was determined based on the range starting from the mean score of difficultness to the mean score of usefulness, 4) based on the results visualized the order of elements based on the range in the form of “pyramid”, sequentially ranging from the largest range are assignment, quiz, feedback, discussion, link to resources, book, survey, learning design, handout, and chat, 5) The five priority elements to be improved were assignment, quiz, feedback, discussion and link to resources. It is further concluded that this new method can be applied easily to select the prioritized components in efforts to improve e-learning of health personnel education.

Keywords: *Difficultness-Usefulness Pyramid, e-Learning in health, Management*

INTRODUCTION

In the current information age, health institutions such as health offices, hospitals, and health education institutions have utilized information and communication technology (ICT) in various organizational activities. One of the utilization of ICT in educational institution of health worker is as the main support in the implementation of learning activity known as e-learning.⁽¹⁾

The progress of education of health workers will greatly determine the quality of health workers generated. For that reason, the belief in the importance of the progress of education of health workers must be really considered important by the managers of

educational institutions. Especially in the information age, information flows very quickly through the whole world. Without being able to keep up with the development of educational world spread through the development of information technology in this era, our health education institution will be far behind.⁽²⁾

In Indonesia, there are still many health education institutions that have not implemented e-learning. Meanwhile, institutions that have implemented e-learning, many still can not run it optimally. The lecturers still have many technical difficulties in managing e-learning. This will make the e-learning system not fully ready for use. Thus, students as consumers will use e-learning system that is not yet fully prepared.⁽²⁾

Referring to Moodle as a e-learning software that is widely used, there are some basic elements in e-learning that must be managed by lecturers. They are learning design, handouts, books, links to resources, discussion, chats, assignments, feedback, quizzes, and surveys. Ideal

Corresponding Author:

Heru Santoso Wahito Nugroho
Health Polytechnic of Ministry of Health in Surabaya,
Indonesia
Pucang Jajar Tengah Street 56 Surabaya, Indonesia
Email: heruswn@gmail.com

e-learning requires that all of the above components are prepared and operable properly.⁽³⁾

Preliminary study results through interviews with lecturers and students at the Health Polytechnic of the Ministry of Health in Surabaya as one of the health education institutions in Indonesia showed that most of them stated that they were not proficient in operating e-learning. All the lecturers interviewed stated that the design of the lesson was still made by the website administrator and they stayed to fill the learning topics for one semester. Components that had been well understood by the lecturers are the preparation of teaching materials files and provision of links to learning resources, while the provision of books, discussion forums, chats, assignments, feedback, quizzes and surveys could not be run smoothly. Meanwhile, most of the students stated that they were new to e-learning system and intend to learn it, but they were having difficulties because most of the related lecturers could not be good guides for students as followers of their courses.

The above description is one example of the still weak implementation of e-learning in the education of health workers in Indonesia. Fortunately, e-learning systems can still run even though not all components are run by lecturers and students. For example, although e-learning is available only in instructional designs and teaching material files, students can still use the system to look at the lessons learned in one semester and download the teaching materials they need.

The problem as described above must be an important concern for e-learning system managers. It has been described above that e-learning can still run even though not apply all the components that exist. Thus, managers need to select the prioritized components for improved tuning and operation, so that it is expected to gradually increase the number of components that can be run well, and in turn all components can be run optimally by lecturers and students as users.

MATERIAL AND METHODS

This research was an attempt to create a simple new method in order to select the elements of e-learning for health professional education in order of priority. The study was conducted in 2017 at the Department of Environmental Health, Health Polytechnic of the Ministry of Health in Surabaya. The main sources needed in this

study were: 1) the literatures of information systems, 2) the information systems experts, 3) the lecturers in health, 4) the students.

The creation of this new method is implemented with several steps: 1) selection of e-learning elements that will be prioritized through the literature review, 2) selection of attributes used as a basis for priority determination through review literature and expert considerations, 3) determination of the method of selecting the elements of e-learning, 4) testing methods through field research, 5) conclusion and recommendation submission.

FINDINGS

1. Selection of the elements of e-learning that

will be prioritized: The selection of e-learning elements of education for health workers to be prioritized through literature review. In this regard, the main literature was the most popular open source e-learning software guides that are part of Softaculous in cPanel, a well-known website management panel. In Softaculous were available seven e-learning software that is Chamilo, Claroline, Moodle, eFront, Dokeos, DoceboLMS and ATutor. Referring to the above literatures, 10 main elements of e-learning were chosen: learning design, handout, book, link to resources, discussion forum, chatting, assignment, feedback, quiz and survey.⁽³⁾

2. Selection of attributes used as the basis for priority setting:

The literature review was directed to a theoretical model of user acceptance to information technology in a variety of systems, including e-learning. According to Surendran (2012), one of the most widely used models was the Technology Acceptance Model (TAM) which in this case had evolved into three generations of TAM, TAM-2, and TAM-3.⁽⁴⁾ In TAM⁽⁵⁾, TAM-2⁽⁶⁾ and TAM-3⁽⁷⁾ introduced two specific beliefs as determinant of user acceptance of information technology “perceived usefulness” and “perceived ease of use”. Users will be more likely to accept the implementation of ICT voluntarily if the technology is felt useful and can be used easily. Thus, referring to the two attributes above, the priority elements to be fixed first were elements that were still difficult to use but were perceived to be more useful or more important by the user.

In other words, the prioritized elements were the elements with high “ease of use” and “usefulness”.

The results of the literature review were discussed with relevant experts from two scientific institutions: “Humanistic Network for Science and Technology” (HNST). It was agreed that “ease of use” and “usefulness” were defined as attributes used as the basis for the determination of priority elements in improving the quality of e-learning in the education of health workers. In this case it was also agreed that the term “ease of use” was changed to “difficulty” with consideration to facilitate its application in practice.

3. Determination of the method of selecting the prioritized elements:

The two predefined attributes were subsequently used as a basis for assigning weight to each of the elements of e-learning for health workers. Difficulty had a negative nature, in the sense that the higher the difficulty the resulting score becomes more negative. Usefulness was positive, in the sense that the higher the usefulness the score becomes more positive. Thus, a negative score was given for difficulty and a positive score for usefulness. In this case the span 10 was used in the semantic differential for the instrument design as follows.

Table 1: Instruments for selecting e-learning elements based on priorities

Difficulty	Elements	Usefulness
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Learning design	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Handout	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Book	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Link to resources	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Discussion	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Chatting	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Assignment	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Feedback	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Quiz	Low 0 1 2 3 4 5 6 7 8 9 10 High
High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 Low	Survey	Low 0 1 2 3 4 5 6 7 8 9 10 High

4. Trial through field research: Data collection was performed using the instrument as shown in Table 1. Students were asked to fill the questionnaire was guided directly by researchers. Then check the accuracy and completeness of filling the entire questionnaire and continued with computerized data entry. The next step was to analyze the data descriptively ie calculate the mean score of difficulty and usefulness for each element, and calculate the range starting from mean-score of difficulty to mean-score of usefulness. The range of each element was arranged sequentially starting from the smallest (Table 2). Finally, these ordered ranges were presented in the form of pyramid to make it easier to understand (Figure 1). It appears that the largest range was at the bottom, while the smallest range was at the top.

Table 2: The Rank of Mean-Score Based on Range

Mean-Score of Difficulty	Elements	Mean-Score of Usefulness	Range
-2.00	Chatting	2.67	4.67
-1.40	Handout	6.80	8.20
-1.35	Learning design	6.99	8.34
-4.73	Survey	7.00	11.73
-2.00	Book	9.77	11.77
-3.01	Link to resources	9.80	12.81
-5.01	Discussion	8.50	13.51
-8.22	Feedback	7.11	15.33
-8.88	Quiz	8.00	16.88
-9.88	Assignment	8.88	18.76

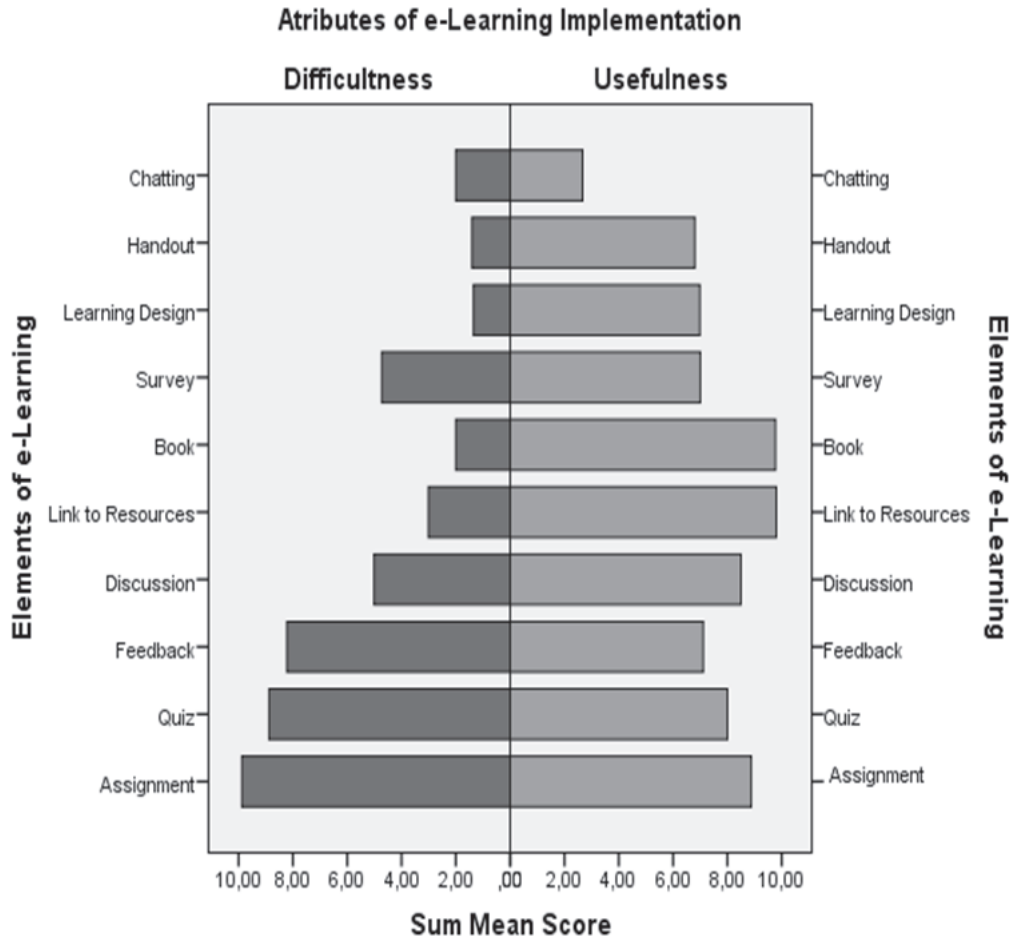


Figure 1: The Rank of Mean-Score

5. Conclusion and recommendation submission:

The largest range (bottom position in the pyramid) was “assignment”. Thus, “assignment” was the first priority element in the improvement of e-learning for health workers, followed by quiz, feedback, discussion, link to resources, book, survey, learning design, handout and chatting. It was recommended that the 5 elements with the largest range (assignment, quiz, feedback, discussion and link to resources) prioritized to be fixed first, while the 5 elements with the smallest range can be fixed later.

DISCUSSION

This research presents a new method in determining the initial step in order to improve the quality of

e-learning for health workers. In the first step had selected the ten elements that refer to the most frequently used e-learning programs of learning design, handouts, books, links to resources, discussion forums, chats, assignment, feedback, quiz and survey. This selection had been carefully selected referring to a credible source of information that is the software selected to be included in Softaculous, an organizer of software used by cPanel as a leading website management program.⁽³⁾

In the second step had been selected two attributes of difficulty and usefulness. Both attributes had been selected based on careful consideration through literature review. Since e-learning was one part of the implementation of ICT-based systems, it had been decided to track the key determinants for ICT acceptance by users. Referring to the TAM in three generations^{(5),(6),(7)} as one of the most widely used technology acceptance models⁽⁴⁾, the selection of the two determinants is considered the right choice. After going through a

discussion process involving experts from HNST, there was a change of terminology that was “ease of use” changed to “difficultness”. This decision is good because this new terminology is easier to apply in practice.

In the third step had been decided that “difficultness” was an attribute that must be lowered in value so it might be scored with a negative sign; while “usefulness” was an attribute that must be increased in value so it might be scored with a positive sign. If presented in diagrammatic form, the difference in scoring ways for these two attributes will result in rods to the left for “difficultness” and the rods to the right for “usefulness”. The priority was the element that had the greatest total value for “difficultness” and “usefulness”, or in other words the element with the largest range, ranging from the value of “difficultness” to “usefulness”. The use of pyramid form was intended for the results of the analysis could be understood quickly. In this regard, the experts involved in the discussion gave a positive appreciation that the analysis and presentation of this pyramid was a good choice. In this case, the pyramid could be created manually or using statistical software such as SPSS, using the facility of making a “population pyramid”⁽⁸⁾.

In the fourth step, e-learning elements were successfully sorted from the elements that most need immediate improvement. In this case, after being arranged sequentially from number 1 to number 10, they were also considered necessary to be divided into two major groups, hoping that the improvement of those elements can be organized more easily, for example the first stage for 5 elements with high priority and second stage for 5 elements with low priority.

In the fifth step, making conclusions could be done easily because the results of data analysis had been presented visually in the form of a pyramid. In this case, the element at the bottom of the position was the first priority, then sequentially followed by the elements above it, and the top element was the last priority. Recommendations could also be easily submitted because they refer to the priority sequences that had been obtained in the research conclusions. Based on these conclusions and recommendations, e-learning managers can immediately develop improvement according to the characteristics of these elements.

The entire process above is an effort directed to improve the quality of e-learning for health workers.

The focus of this method is to visualize the results of data analysis in the form of “PYRAMID” so it is easy to understand. Furthermore this pyramid was introduced under the name “DIFFICULTNESS-USEFULNESS PYRAMID (DUP)”.

It should be noted that in this study, “e-learning for health workers” is an example of an object that will be the target of quality improvement efforts. Thus, there is an opportunity to apply the whole of this process to other objects, such as telemedicine, e-Health, e-journals and so forth. Researchers must first select the elements that are relevant to the object. In addition to referring to established literature, related elements can also be explored from the users of the system to be worked on, for example through a dedicated group discussion or brainstorming.⁽⁹⁾

CONCLUSION

This research has resulted in a new method that can be applied easily to select the elements that are prioritized in order to improve e-learning in the education of health workers. These findings are expected to contribute positively to improving the quality of education management of health workers and can also be developed for other health systems.

Conflict-of-Interest Statement: The authors declare that there is no conflict of interest related to this research.

Source of Funding: All funds used to support research comes from the researchers themselves.

Ethical Clearance: Ethical clearance taken from Ethics Committee of Institute of Health Science “Maluku Husada” with number “RK. 01/KEPK/STIK/XII/2017”.

REFERENCES

1. Nugroho HSW, Supriyanto S, Notobroto HB. The role of perceived organizational support, personal characteristic and perceived enjoyment in acceptance model of maternal and child health information systems. Airlangga University; 2016.
2. Nugroho HSW. The application of classroom action research (CAR) in health education (Aplikasi penelitian tindakan kelas (PTK) dalam pendidikan kesehatan). 1st ed. Sunarto, editor. Ponorogo: Forum Ilmiah Kesehatan (FORIKES); 2017.

3. Tutorials Point. cPanel Tutorial [Internet]. Tutorials Point, Simply Easy Learning. 2107 [cited 2018 Jan 3]. Available from: <https://www.tutorialspoint.com/cpanel>
4. Surendran P. Technology Acceptance Model: A survey of literature. *Int J Bus Soc Res.* 2012;2(4):175–8.
5. Davis FD, Bagozzi RP, Warshaw PR. User acceptance of computer technology: a comparison of two theoretical models. *Manage Sci.* 1989;35(8):982–1003.
6. Venkatesh V, Davis F. Theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Manage Sci.* 2000;46(2):186–204.
7. Venkatesh V, Bala H. Technology Acceptance Model 3 and A Research Agenda on Interventions. *Decis Sci* [Internet]. 2008;39(2):273–315. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-5915.2008.00192.x/pdf>
8. IBM Knowledge Center. Obtaining population pyramids [Internet]. 2018 [cited 2018 Jan 4]. Available from: https://www.ibm.com/support/knowledgecenter/en/SSLVMB_24.0.0/spss/base/idh_idd_population_pyramid.html
9. Nugroho HSW. Quality of health service according to consumer perception (Kualitas layanan kesehatan menurut persepsi konsumen). 1st ed. Sunarto, editor. Magetan: Forum Ilmiah Kesehatan (FORIKES); 2011.