E-Aviation Basic Enroute Flight Information Surveillance Using CRAP Method

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ABSTRACT

Enroute Flight Information Surveillance is driving the plane when traveling to Uncontrolled Airspace Class G with the help of a radar that appears passing by Air Situation Display. The focus of this research is to create E-Module interesting and innovative..E-Module was designed with the CRAP stage method (Curriculum, Review, Analyze, Polish). Existing material will be formed into flipbooks and can be accessed through the Learning Management System. The number of participants is N = 30 to test the feasibility of the E-Module. The aim of this research is to design and develop an E-aviation basic enroute flight information surveillance module. The results of the validity test have been declared valid and the value reliability test Cronbach's Alpha with the number 0.860 which is included in the very good category from material and media expert validators. From the results of research conducted it can be concluded that E-Module Basic EFI Surveillance suitable for use as a training reference.

Keywords: E-Module, Enroute Flight Information Surveillance, CRAP, Learning Management System (LMS)

1. INTRODUCTION

The Surabaya Aviation Polytechnic is a higher education institution under the Indonesian Ministry of Transportation, with the main task of implementing a professional education diploma program in the field of engineering expertise and aviation safety which is open to the public [1]. One of these study programs is D3 Aviation Communication which will study the distribution of messages *Air Traffic Service* (ATS) by using media *Aeronautical Fixed Telecommunication Network* (AFTN) as well as providing air traffic services in the form of flight-related information, advice and warnings to aircraft flying in the airspace via HF radio communication devices [2]. This flight information and news must be conveyed from the time the plane takes off from the origin airport, the airports it passes through, until it reaches the destination airport [3].

The general goal of graduates of this study program is that participants are expected to be able to work professionally in aviation communications for the benefit of the Civil Aviation sub-sector with suitability and coherence of personality, knowledge and skills (education), creative skills (research), work behavior and social life (community service). to support aviation safety and be able to keep up with developments in science, legislation, and technology in accordance with Pancasila and the 1945 Constitution of the Republic of Indonesia. As well as the specific objectives of graduates of this study program are to be able to produce graduates who (1) have the ability to carry out their duties as Aviation Communications personnel safely and efficiently in the airspace for which they are responsible (*Uncontrolled Airpsace*), (2) Have the skills to solve problems in certain situations with individual responsibility according to workload, (3) Dedication and integrity as commitment and high integrity to quality, time, and ability to understand ethical, social, and professional responsibilities, (4) Communication and outreach skills, including effective communication, both orally and in writing within the profession, and the ability to work effectively in teams, and respect professional differences and knowledge, contemporary, social and global issues [3].

After studying for 3 years, *output* graduates of the D3 aviation communication study program are *Aeronautical Communication Officer* (ACO) which has

2 ratings as proof of competence in work practices, namely rating *Aeronautical Fixed* and *Flight Information.* Furthermore, one of the services provided by ACO is *Enroute Flight Information* (EFI). *Enroute Flight Information* is the driving of an aircraft that is in the territory *uncontrolled airspace* [4] [5] [6]. EFI service every *Flight Information Centre* (FIC) has different ATS facilities, one of which is Ujung Pandang FIC Bali *Sector* who have experienced modernity who have used the facilities *surveillance* [7].

Enroute Flight Information Surveillance is an flight navigation system that uses radar and satellite technology to monitor the position of aircraft and the surrounding environment during flight on a course *enroute* [8] [9]. Therefore, competence in EFI should be *surveillance* must be applied to cadets, especially cadets of the Surabaya Aviation Polytechnic. The following are some of the actions that can be implemented: (1) Optimizing the use of equipment: It is necessary to optimize the use of equipment *surveillance* like radar at APP Radar Laboratory to improve knowledge *Enroute Flight Information* based *surveillance,* (2) Conduct training and certification: Training and certification needs to be provided to cadets to ensure that they have the necessary knowledge and skills to carry out their duties, especially in *Enroute Flight Information,* (3) Implement a proactive monitoring system: Surabaya Aviation Polytechnic Cadets can implement a proactive monitoring system, which allows early detection and preventive action before problems occur in surveillance *enroute*. (4) Optimizing the communication system: The communication between the ACO and the pilot needs to be optimized for surveillance *enroute* can be done more effectively. This can be done by ensuring that all personnel are trained in the use of communication systems and improving existing communication infrastructure, (5) Carrying out continuous evaluation and improvement: Evaluation and improvement of the monitoring system *enroute* needs to be done regularly to ensure quality is maintained. This can be done by carrying out audits and fixing detected problems.

Based on curriculum and syllabus about *En-route Flight Information Surveillance* also in has been published as one of the training curricula to provide knowledge about Regulation, *Procedure En-Route Flight Information*, *Communication Technique*, *Separation Method* and *Minima*, *Flight Information Service, Surveillance Operating Procedure* (*Surveillance* and ADS-B), *Technical Monitoring* (*Surveillance* and ADS-B) and EFI *Surveillance* [1] [10]. This publication reference also refers to the benefits of use *surveillance.* There are 3 important functions of ATS *Surveillance* to assist operations *Aeronatucial Communication Officer* (ACO) namely [11] [12] [13]

1) Can provide advice to aircraft that will conflict on the same route or point by way of providing a reference *bearing* and *distance* by pulling the vector from *reference point* against planes

2) have up-to-date weather information to advise aircraft to avoid the area,

3) able to assist the aircraft in navigation by providing clear vectorization regarding the position of the aircraft *actual time,* know clearly the flight data of the aircraft connected with *flight plan*, including *Call sign*, *Speed*, *Altitude/Flight Level*, *Departure/Destination*, as well as *type of aircraft*.

Therefore increasing EFI competence *surveillance* in Surabaya-based Aviation Polytechnic cadets *e-module* by method *CRAP* become an important effort to prepare cadets to become personnel *Aeronautical Communication Officer* reliable to understand and master this navigation system so as to be able to provide services *Flight Information* accurate and safe for the pilot when navigating [7] [14]. With *e-module* facilitated in *Learning Management System* (LMS) based *Content Management System* (CMS) that is interactive and innovative on *platform moodle* certainly will provide an atmosphere of education and practice to be fun [15] [16] [17]. Online learning can solve the limitations of traditional ways of learning. Some of the skills required to learn with online media include knowledge of technological connectivity. Online learning does not take much time, quick process, easy to improve learning results [18] [19].

2. METHOD

The research design used in this study is the method *Research and Development* (R&D). this research method aims to design, develop, and improve a product or service [21]. Generally this method is used in the fields of technology and education to produce better products or services. The R&D research design consists of several stages [22], namely needs analysis, design, development, evaluation, improvement.

The R&D method used in this study uses the CRAP stages (*Curriculum, Review, Analysis, Polish*) which is an alternative or effectiveness of the ADDIE stage. This CRAP stage provides a shorter and optimal flow because it is a direct approach to developing the required content from the existing curriculum.

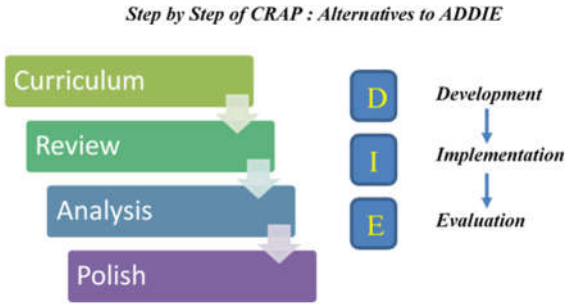

Figure 1 *Flow of Stages CRAP*

Based on **Figure 1** an optimization of the ADDIE stage, namely without doing analysis & re-design, but directly using content development that leads to products to design and develop *Learning Management System* (LMS) [23]. Especially the Surabaya Aviation Polytechnic with material *Enroute Flight Information Surveillance*

2.1 Curriculum

At this stage, an analysis of the curriculum or material is carried out learning required to develop an LMS with the contents of the Enroute Flight Information Surveillance material. This step includes identifying learning objectives, materials learning, and learning methods that are suitable for LMS development.

2.2 Review

At this stage, a review or evaluation of the curriculum is carried out or learning materials that have been identified at the stage First. This evaluation aims to ensure that the material selected according to needs and can help the goal predetermined learning.

2.3 Analysis

After going through the review stage, an analysis was carried out on technology and features needed to develop LMS with contents of Enroute Flight Information Surveillance material. This step includes designing concepts, features, and specifications LMS technical.

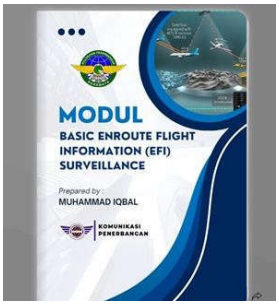

Figure 2 *E-Aviation Basic EFI Surveillance Module*

Figure 3 *Features in E-Module*

2.4 Polish

The final stage is polishing or refinement of LMS that has been developed. At this stage, done evaluation and testing of the LMS to ensure that LMS can function properly and can be used by user easily. Next, improvements are made on the LMS if deficiencies or problems are found.

2.5 Participants

Participants in this study totaled 30 people with details of 25 cadets, 5 alumni and validators. Participants are taken by *randomize purposive sampling*, with inclusion criteria ranging from 19 to 25 years old because they are still in the training stage and are just getting relevant material. Participants will fill out a questionnaire via *zohoform* to find out one's opinions, perceptions, or attitudes towards a social phenomenon that occurs [20].

2.6 Procedures

Testing techniques for products under development researche*-module* EFI *Surveillance* This is divided into two stages. The first stage is expert validation consisting of material or content experts and media experts using a validation questionnaire adapted from the National Education Standards Agency (BSNP). While the second stage was product trials for training students and alumni of the Aviation Communications study program with 30 participants to fill out a questionnaire via *zohoform.* The analysis technique uses validity and reliability tests using a scale *likert* knowing one's opinion, perception, or attitude towards a social phenomenon that occurs [20].

3. RESULT AND DISCUSSION

Research on design *E-Module Basic* EFI *Surveillance* in aviation polytechnic cadets with a total of 25 people and 5 alumni and validators. In terms of inclusion criteria, there are several subjects that must be met, including those aged 19-25 years. The following is subject data based on age differences:

Table 1 *Subject Categorization Based on Age*

Subject Age	Frequency	Percentage
19 years	5	17 %
20 years	3	10 %
21 years	10	33 %
22 years	10	33 %
23 years	2	7 %

Based on **table 1**, it can be seen that the majority of subjects aged 21 - 22 years, namely 33% with a total of 20 people. Most subjects then aged 19 years amounted to 17% or 5 people, the subject was 20 years amounted to 10% or 3 people, subjects aged 23 years amounted to 7% or 2 persons.

The following are the results of the validity and reliability tests with assistance *SPSS* 26

Table 2 *Descriptive Statistical Validity Test*

Question (Q)	*Corrected Item-Total Correlation*
Q 1	.505
Q 2	.492
Q 3	.619
Q 4	.737
Q 5	.501
Q 6	.557
Q 7	.481
Q 8	.621
Q 9	.660
Q 10	.506

Based on **table 2**, q is a statement representing the feasibility of the questionnaire to the respondent and expert validator. it is known that in column *Corrected Item-Total Corrleation.* Each valute in this column compared to N = 30 is the number of participants, so the value is r_{tabel} is obtained value **0.361.** the value being compared is the value *Corrected Item-Total Corrleation* on r_{tabel} values. It was found that all questions had a value above 0.361, it could be stated that all questions were valid.

Table 3 *Descriptive Statistical Reliability Test*

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.852	.860	10

Based on **table 3** that the reliability is measured in value *Cronbach's Alpha* is 0.860 so that the reliability of these questions **is very good**. As well as the calculation of the scale test *likert* below namely:

Table 4 *Result Likert Scale*

No	Question (Q)	Scale STS	TS	C	S	SS	Index Formula *Likert Scale*
1	Q01				9	21	$\frac{141}{150} x\ 100 = 94\%$
2	Q02			1	14	15	$\frac{148}{150} x\ 100 = 99\%$
3	Q03			2	7	21	$\frac{136}{150} x\ 100 = 91\%$
4	Q04			1	12	17	$\frac{136}{150} x\ 100 = 91\%$
5	Q05			1	10	19	$\frac{138}{150} x\ 100 = 92\%$
6	Q06			1	9	20	$\frac{139}{150} x\ 100 = 93\%$
7	Q07				16	14	$\frac{134}{150} x\ 100 = 89\%$
8	Q08			4	12	14	$\frac{130}{150} x\ 100 = 87\%$
9	Q09			2	8	20	$\frac{138}{150} x\ 100 = 92\%$
10	Q10				8	22	$\frac{142}{150} x\ 100 = 95\%$

Based on **table 4** above, q is a statement representing the feasibility of the questionnaire to the respondent it is found that all questions were answered with a weight range of 89-99%. It can be concluded that the questions asked by 30 respondents have represented the material and media used in *E-Module Basic* EFI *Surveillance*

The author realizes that the E-Module design results still have some deficiencies, these points are stated in the validation of material experts and media and users who have accessed the E-Module Basic Enroute Flight Information Surveillance stated that the E-Module was feasible to use. It is hoped that researchers in the future will be able to use this module used as a training reference or refresher related material Enroute Flight Information Surveillance

4. CONCLUSION

Based on the design and the results of the discussion *E-Module Basic EFI Surveillance* that has been processed, it can be concluded that :

1) In the design and discussion results produce a *E-Module Basic EFI Surveillance* which is implemented into the Surabaya Aviation Polytechnic LMS to facilitate and assist EFI learning.*E-Module Basic EFI Surveillance* It has learning features that can attract reading interest through animation, video as well as audio which can make it easier for cadets and users to understand. It

contains sources of information in the form of videos, images, and validated reference documents. In addition there is also *quiz* and examples *problem EFI* to measure the extent to which users understand the material and are able to apply it.

2) The results of the analysis of the validity and reliability of *E-Module Basic* EFI *Suveillance* has been declared valid with r_{tabel} as big **0.361**. any related questions *E-Module* has reached a value above r_{tabel} with the number of participants as much as N = 30. Then the value *Cronbach's Alpha* to test the reliability of these questions with the number 0860 which belongs to the category **Verygood.**

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