The Implementation of E-Learning Model in Science Class to Enhance Learning Achievement and Learning Motivation of Students with Physical Disability

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ABSTRACT

Applied e-learning model in science class attended by special need students (physical disability) is an innovation, new creation, and new reflection in instruction natural science. This research aims to know the effectivity of model applied e-learning, based on the domain used in learning process. It also analyzes the need, the input characteristic of Special Need Students-Physical Disability. The subject of this study are the students of special senior high school. The result of this research shows that (1) implementing e-learning model in Science class for special need students can increase learning motivation of special need students, and (2) implementing e-learning model in Science class can increase learning achievement of special need students.

Introduction

Students with physical disability are the same as those who are normal. They tend to have low learning motivation. However, there is an interesting fact shown by those disability students in which they are interested and eager to know something (learning) if the material is concrete and visualized through audio visual media (electronic learning) which is based on Information Communication Technologies (Hadis, 2012:2). Nowadays, electronic based learning media is very advanced due to the development of knowledge and technology, especially in the field of electronic technology, education, and ICT (Sidik, 2016:154).

Through e-learning learning model, it is expected that special needs students who face physical disability are able to learn independently in accordance with their interest in learning the material of science. In other words, e-learning is able to change the old paradigm which is teacher-centered (which is still commonly used nowadays) into student-centered learning. This is in accordance with the findings by Sidik (2015) which concludes that there are 78,67% approach which is still teacher-centered, while there are only 13,33% student-centered.

The implementation of e-learning model for special need students with physical disability in Special Senior High School (SMALB) Pembina South Sulawesi is mostly possible because this school had provided various electronic learning media such as appropriate laptop, computer, internet connection and phone connection. Meanwhile, teachers' interest and motivation in teaching students with general special needs and teachers' interest and motivation in teaching physical disability students are very high with the help of e-learning or electronic media, which is an interesting learning for them. However, their knowledge and experience in using the equipment are need to be improved so that they are able to master e-learning-ICT learning model in teaching science to students with physical disability who have high intelligent. Therefore, in the perspective of micro, dominant factor which highly contributes to the quality of the education in a school is qualified teachers in teaching, educating, training and guiding the students (Suara Pembaruan, 2006). The process of learning evaluation is an example of educational quality control of teachers' contribution (Sasmoko, 1998). Therefore, the teachers have to be professional in working because future education demand qualified education with professional skill (Megarry and Dean, 1999).

Teachers as instructors and educators have to master information communication and technology. Especially, they need to be able to apply e-learning model as learning sources, method, and educational media because ICT has high contribution in the quality of education (Setiawan, 2006:54). E-learning is a learning process using internet which is combined with face to face meeting so that it can improve the effectiveness of learning (Setiawan, 2006:57). Thompson, Ganxglas, and Simon (2000) define e-learning as an instructional content or learning experienced delivered or enabled by electronic technology which means that electronic learning is the learning content or learning experiences which are conveyed through electronic technology. E-learning can also be defined as a learning method which is based on electronic or information communication technology. E-learning as one of learning approaches or methods is able to give the flexibility, interactivity, speed, and visualization through various advantages from various technologies.

The current problem is that not all educational institutions pay serious and real attention on the implementation of e-learning with ICT based learning, especially in that special education institution. One of the hindrances faced by the institution in this era is in providing a learning process for every student in the right time and not limited to the location of the students. This statement is stated by two world masters, Arie DeGeus of Royal Dutch/Shell Oil and Peter Senge (the author of The Fifth Discipline), mentioned that the ability to learn faster than your competitors may be the only sustainable competitive advantage (SWAP, 2004).

One of the solution to answer that challenge is that by facilitating the need of independent learning for students which has been adjusted to their need, interest, characteristic, and limited ability possessed by each student, either normal students or students with special need, especially those with physical disability. It need to be remember that conventional learning nowadays has lost its value in an educational institution in this era which is decentralization and in ICT era of globalization. Therefore, independent learning has vast improvement and convergent which happens on information technology and telecommunication technology (Johnso, 2005). Various technologies and applications have been created to support the operational activity of human life or institution including the teaching and learning process such as learning technology which uses Internet facility in form of e-learning (Meyen, 2000).

E-learning needs a certain model which is designed in form of innovative learning. The developer has the chance in planning from previous experiences in implementing e-learning program. In terms of the development of e-learning, the learning material with ICT is expected to be able to develop the overall competence in teaching in the learning process of e-learning. The developer is expected to be able to fulfill the lack of substance or time which might occurs in conventional learning, however, the well-structured learning experience is not enough to fulfill the lack of communication in the e-learning process. Students' learning performance through e-learning is showing e-learning component in integrating the learning process. Electronic communication is combined with the learning process needed to place learning in an e-learning facility format which is integrated in content structure (Setiawan, 2006:55).

E-learning is not a new thing or is not a new experience, for some normal students in educational institution. However, the implementation of e-learning with ICT based for students with special needs especially those with physical disability in SMALB Pembina South Sulawesi is a new, innovative, and creative thing. Therefore, e-learning is a new experience for students with physical disability. The concerned students with physical disability are trained to relate their experience in the society related to science with e-learning based science material in class. The students with physical disability are instructed to remember their impression on their previous learning experiences in class to make the students with physical disability aware of the differences between conventional learning and e-learning. It is assumed that they are personally will be a developer of e-learning in the future, and/or in the additional class of e-learning.

Based on the connectivity and communication, e-learning is an effort to create the connection between the students and their learning sources in the form of database, teachers, experts, library, and laboratory which are not bounded with time and place and physically apart and distance (Kibby, 1999). Through the support of the well developed and the advanced ICT and the demand of global competition, e-learning is not only an alternative media in the learning process but also a mean to achieve the competence in this global competition (Hadiana and Kajjiri, 2003). The form of interactive component in learning synchronously and various visualizations makes the material in the learning process is easy to be comprehended through E-learning (Kerka and Wonacott, 2000).

The main problem in this study is focused onto (1) how to design Science class with e-learning model for students with physical disability?, (2) can the implementation of Science learning with e-learning increase the learning motivation of students with physical disability?, and (3) can the implementation of science learning with e-learning-ICT model improve the learning achievement of students with physical disability?.

The objectives of this study are to know (1) the effectiveness of the implementation of science learning using e-learning model in increasing the learning motivation of students with physical disability, and (2) the effectiveness of the implementation of science learning with e-learning in improving the learning achievement of students with physical disability. Students with physical disability become the object of this study due to their high intellectual. Thus, it is assumed that they are aware of or literate to ICT. The subject of this study is the twelevth grade students with special needs of SMALB Pembina South Sulawesi.

Method

This study is an experimental study on a single group to know the effect of the implementation of e-learning with ICT model in the science learning process for students with physical disability who have high intelligence. The effect of the implementation of that model is studied from its contribution in increasing students' learning motivation and students' learning achievement from the students with special need, physical disability.

The technique used in the data collection is the test for knowing the learning achievement of Science subject, test/questionnaires for knowing the learning motivation, interview with the teacher and students, and observation for knowing students behavior inside the class, and documentation technique. Test for knowing students learning achievement in Science subject, learning motivation questionnaire, observation sheet/guide and interview are made by the researcher while documentation techniques is used as supplemental technique in obtaining the data regarding physical disability students' profile, students' academic report which shows the improvement of students' learning achievement, and other relevant documents which support this study.

Data was analyzed using (1) quantitative analysis in form of percentage, and T-Test, and (2) qualitative analysis to describe the category of the improvement of the learning motivation students' learning achievement. Percentage analysis is used to present the availability of the facility and infrastructure for the sake of Science learning with e-learning in Special School (SLB) South Sulawesi class advisor, while the data analysis with T-Test is used to test the availability of the effect of Science learning with e-learning with ICT model in improving the learning motivation and learning achievement of students with physical disability.

Results and Discussion

Table 1. The Availability of Facilities and Infrastructure

No.	Aspect	Total (%)	Note

1.	Institution Facility: - Laptop in SLB	80 %	Complete
	- Speedy network	80 %	Complete
	-Internet network	80 %	Complete
	-Phone connection	80 %	Complete
	- Electricity	97 %	Very complete
	- Video-TV audio-visual	80 %	Complete
	- Laboratory/ Computer room	70 %	Complete
2.	Facility Owned by Teacher:		
	-Laptop/computer	78 %	Complete
	-Internet network	70 %	Complete
	-Phone connection	70 %	Complete
	-Modem	70 %	Complete
3.	Students' Facility:		
	-Laptop	80 %	Complete
	-Internet network	78 %	Complete
	-Phone connection and Modem		Incomplete

Table 2. The Result of Data Collection Related to the Students' Readiness in Using E-Learning

No.	E-Learning Domain	Readiness	Note
1.	Symbols system introduction	70 %	Good
2.	Transmission characteristics	50 %	Poor
3.	Decision on failure	30 %	Poor
4.	Mastery of failure solutions	60 %	Good
5.	The intensity of interaction with ICT	80 %	Very Good

Table 3. The Result of Data Collection Related to the Learning Motivation before Science Learning Using E-Learning

No.	Initial of the Students with Physical Disability	Score of the Learning Motivation in Pre Test (Obtained through Learning Motivation Test)
1.	AL	65
2.	AS	67
3.	AW	60
4.	IS	62
5.	IN	60

Table 4. The Result of Data Collection Related to Students' Learning Motivation in Science Subject with E-Learning

No.	Initial of the Students with Physical Disability	Score of the Learning Motivation in Post Test (Obtained through Learning Motivation Test)
1.	AL	75
2.	AS	77
3.	AW	75
4.	IS	70
5.	IN	75

Table 5. The Result of Data Collection Related to Students' Learning Achievement   in Science Subject before the Implementation of E-Learning

No.	Initial of the Students with Physical Disability	Score of the Learning Motivation in Pre Test (Obtained through Learning Achievement Test)
1.	AL	65
2.	AS	67
3.	AW	60
4.	IS	62
5.	IN	60

Table 6. The Result of Data Collection Related to students' Learning Achievement in Science Subject after the Implementation of E-Learning

No.	Initial of the Students with Physical Disability	Score of the Learning Motivation in Post Test (Obtained through Learning Achievement Test)
1.	AL	80

2.	AS	75
3.	AW	75
4.	IS	78
5.	IN	80

Based on the data in Table 1 regarding the availability of facility and infrastructure owned by the institution, teacher, and students with physical disability for science class using e- learning, it is concluded into a description that: (1) the availability of facility and infrastructure owned by special educational institution which covers seven facility and infrastructure items for e-learning is complete in general (complete), (2) the availability of facility and infrastructure owned by teacher of special education which covers four facility and infrastructure items is complete in general (complete), and (3) the availability of facility and infrastructure owned by the students with physical disability which covers three facility and infrastructure items for e- learning is complete in general (complete). Therefore, from the point of facility and infrastructure for implementing e-learning in Science subject, facility and infrastructure owned by the institution, teacher, students with physical disability are supportive and qualified.

Based on the data in Table 2 regarding the level of readiness of students with physical disability in using e-learning domain which covers five domains, it is shown that students' readiness is in the middle level. However, it can be increased if the students are given training in using the concerned e-learning domain. Therefore, from the point of students' readiness in the application of science class with e-learning model is supportive and qualified.

Based on the data in the Table 3 regarding the level of the learning motivation of the students with physical disability before the implementation of e-learning model in Science class, it is known that the average score of students' learning motivation is in middle rate, which is 62.8. Meanwhile, based on the Table 4, the level of students' learning motivation after the implementation of e-learning model in Science subject, it is known that the average score of students' learning motivation is in the high level, which is 74.4. From the previous statement, descriptively, we can see the improvement of student' average score in their learning motivation after the implementation of Science subject with e-learning-ICT model. Therefore, it can be concluded that there is influence from the implementation of e-learning-ICT model is Science subject toward the improvement of the learning motivation of students with physical disability in learning Science.

Based on the data on the Table 5 regarding the level of learning achievement of students with physical disability before the implementation of e-learning in Science subject, it is known that the average score of students' learning achievement is in the middle level, which is 62.8. Meanwhile, based on the Table 6, level of students' learning achievement after the implementation of e-learning model in Science subject, it is known that the average score of students' learning achievement is in high level, which is 77.6. Thus, it can be described that there is improvement in students' learning achievement after the

implementation of e-learning model in Science. Therefore, it can be concluded that there is influence from the implementation of e-learning in Science toward the improvement of the learning achievement of the students with physical disability in learning Science.

To strengthen the result of data analysis in descriptive way, thus the data of learning motivation and learning achievement are also analyzed using statistic, which is t-test. The result of t-test also shows that there is influence from the implementation of e-learning model in Science subject toward the improvement of the learning achievement of students with physical disability in learning Science". This is shown by the differences of the average score of learning motivation and learning achievement of the students with physical disability in the post-test compared to the one in the pretest

Table 7. Interval percentage of component quality of instructional design

Value	Interval Percentage	Criteria
4	81%<X<100%	Very Good
3	61%<X<80%	Good
2	41%<X<60%	Poor
1	21%<X<40%	Very Poor

To know the quality of instructional design component content analysis is used. The use of this method is to know the level of the importance of each instructional design component by looking for the average score of content toward standard of deviation.Based on the result of analysis on all instructional designs made by vocational educators in vocational high school majoring in electronics department can be concluded that the result of the study is as follows.

Table 8. The Result of Instructional Design Component Analysis Subcomponent Learning Objectives

No.	Formulation of Indicators	Obtained Score %
1	Having complete component of formulation of objectives	97
2	Formulated based on Standard of competence, basic competence	91
3	The writing of learning objectives using operational verbs	83
4	Written in form of complete sentences	65
5	Visualizing learning process	87
6	As the basis in making test for learning result	68
7	There is no double meaning in the learning objectives	92

| 8 | There is only one step or activity in each learning objective | 89 |

Table 9. The result of instructional materials components analysis

No.	Indicators of Instructional materials Component	Obtained Score %
1	The validity of the content of instructional materials based on syllabus.	90
2	Instructional materials have the latest content.	92
3	The validity of analog series of figures	97
4	The validity of formation or comparison.	98
5	The quality of the print out.	74

Table 10. The result of learning activities or strategies components analysis

No	Indicators in Determining Learning Strategies	Obtained Score %
1	Pre-learning activities	91
2	The presentation of information and enforcement	98
3	Learners' activities	53
4	Assessment/evaluation	67
5	Giving feedback	47

Table 11. The result of the use of sources/media components analysis

No	Indicators of The Use of Sources /Media	Obtained Score %
1	Attractiveness	78
2	Clarity of symbols system	68
3	Appropriateness with the scope of instructional materials	92
4	Easy to be used	90
5	Time allotment15-25 minutes	93

Table 12. The result of assessment/evaluation components analysis

No	Indicators of Assessment Component	Obtained Score %
1	Measuring all aspects of learning	93
2	Done in the whole session of learning process	56

3	The result of assessment is used as placement/ranking	89
4	Instrument of assessment measure all competences	91
5	Instrument assessment of learning activity	86

Table 13. The result of feedback components analysis

No	Indicators of Giving Feedback	Obtained Score %
1	Giving short test	92
2	Making summary	60
3	Giving reflection	46
4	Giving structured task	58

Based on the result of the analysis of the component of instructional design made by vocational educators in Vocational High School in Makassar, it can be concluded that there are six main components in instructional design which can be explained by looking for the average score and standard of deviation in all components in the following table.

Table 14. The Summary of Instructional design Components Analysis

No	Instructional design Components	N	Min	Max	Mean	Std. Dev.
1	The Set of Learning Objectives and Indicators of Competencies.	72	1	5	3.267	.7910
2	The content of instructional materials competences (main materials).	72	1	5	3.483	1.1035
3	The plan of Learning Activities or Strategies.	72	1	5	3.247	1.0164
4	The Use of Sources/Media.	72	1	5	2.467	.72613
5	The set of assessment/evaluation.	72	1	5	2.091	.67515
6	Giving feedback.	72	1	5	2.014	.78831

The summary of the analysis result in table 6 is obtained and explains that the quality of six components in instructional designs made by educators can be described that the result of this study is in two categories which are good and good enough. The components of instructional design which are in good category are: (i) The formulation of learning objectives, (ii) instructional materials component, and (iii) the plan of activities or the determination of learning strategies. Meanwhile, those which are in good enough categories are:

(i) the use of sources/media, (ii) the determination of assessment/evaluation, (iii) giving feedback. By considering the average score and standard of deviation for six components of instructional design, instructional designs in general can be called as having good qualification. It means the components in instructional designs made by vocational educators can be used as means to know the quality of learning process which is done in electronical learning.

The quality of instructional design components for formulating learning objectives, instructional materials component, activity or determining learning strategy can be discussed that, those three components are main component owned by educators as the main requirements in fulfilling educators' certification in vocational high school of Makassar. Meanwhile the components of using of sources/ media, determining assessment, and giving feedback are in very good quality, this is the weakness comprehensively on educators in understanding the importance of the three components to more activate the learners during the learning process. This is caused by the educators which still focus on the completeness of instructional materials as one of the requirement in fulfilling educators' certification.

Some weaknesses found in the result of the study show that instructional design made by educators of vocational electronics has the same understanding, especially the writing of learning objectives which uses passive sentences and uses more than one verb for one learning objective, the verb is used more in skill verb. The result of theoretical review shows that the writing of learning objectives in learning of vocational high school should use operational verb which is in active form, not in passive form (Regulation of Ministry of National Education 41/2007. School-Based Curriculum –Vocational High School 2008). Therefore, the result of the study is in line with Franklin's statement [5] that learning objectives made by vocational educator of electronics department precisely used to state *Output Indicators*, which is indicator used to measure learning competences in form of procedure. This inexpediency shows that the learning objectives made by educators do not really pay attention to the competences which should be achieved by learners. Therefore, remedial on the definition for educators in formulating indicators of learning objectives is needed as the basis of developing learning so that the process and the result of learning will be better.

There is another inexpediency found between scope of instructional materials and the formulation of learning objectives. In this case is presented in table 7 that there are some basic weaknesses among the explanations of main topic in the instructional design. This actually do not need to be happening because in School-Based Curriculum of Vocational High School 2008 as reference of educator in Indonesia is shown that every topic should be chosen carefully and developed based on the indicator of learning objectives (learning outcome). The weakness of this finding shows that educators have not fully decided on instructional materials based on the formulation of learning objectives.

Finding for activity component of learning strategy produced in good category based on Table 7 while in Table 3 it is known that: (1) the formulation of real learning activities have not visualized the real learning activities based on instructional design, (2) there has not been a learning activity which involved

mental and physical process through interaction among learners, between learners with educator, and between learners and instructional materials, (3) learning process has not referred to student centered learning, (4) learning activities has not in line with varied competences which should be mastered by learners. The result of this study shows that learning activities designed by educator in order to give learning experience which involves mental and physical process through varied interactions inside and outside the classroom using varied approaches.

The next finding, the component of sources selection, assessment, and feedback can be categorized as good enough. Some weaknesses found such as simple learning sources and cannot support the learning process. The weakness of learning assessment has not met the standard of the Regulation of Ministry of National Education (2007)] because: (i) the assessment has not referred to the formulation of indicators in the learning objectives, (ii) the assessment is done by educator only focuses on the assessment technique without referring to assessment procedure, (iii) technique used is not always appropriate with the indicator for learning objectives. Component of feedback is found to be very simple and the closing of learning process and giving simple task, so that the learning process is closed by common expression. This assessment result category is not difficult to be explored so that it can produce better (authentic) assessment which needs to be exist in instructional design made by vocational educator of vocational high school in Makassar.

Based on the result of this study described above then can be concluded that: (1) generally the quality of instructional design component is not fully fulfill the component which has to be based on standard of process, (2) the determination of learning objectives component of learning outcome due to criteria, audience, behavior, condition, degree have not been written consistently in learning objectives, (3) the determination of instructional materials in main topics have not referred to the detail explanation in form of pointers as main focus, (4) the selection of learning strategies has not been done consistently based on systematic (introduction, main activity, closing activity), (5) as instructional design has not been fully found the procedure and assessment technique used to assess learning process, (6) giving feedback is done separately from the learning process so that the end of learning process does not give enforcement and learning motivation to the learners.

Conclusıons and Suggestıons

Based on the result of this study, some conclusions can be drawn. There are some weaknesses found in the instructional design, however these findings are relevant and useful to visualize the existing instructional design made by the current educators. The result of this critical review shows that: (1) teachers' beliefs on the importance of instructional design component is varied. It is expected that there is educator which believe that this is only administrative activity so that the function on the learning process is not related in improving the quality of learning process and learning outcome, (2) teachers' understanding on the instructional design and its development is still low, if it is related to scientific approach in order to develop vocational skills of learners, (3) educators' point of view on instructional design as a guidance in learning process is still relatively simple, (4) educators' ability to design and develop instructional

design still needs guidance and supervision so that educators able to create instructional design with better quality.

Remedial effort on the quality of instructional design made by educators it is suggested that: (1) the need of enforcement to educators that instructional design is made not only for administrative purposes but also for professional development for every educator, (2) design and development of learning process should be done continuously because every design component has certain function and has strong relation with the quality of process and learning, (3) the effort of improving educators understanding and competence need to be continuously improved based on learners' characteristic through varied experiences among the learners in their vocational program which is Electronical Department continuously until good instructional design can be made to be implemented in vocational high schools in Makassar.

Disclosure statement

The Authors reported that no competing financial interest.

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