



# Module for Developing Learning Media Applications for Wireless Networks

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## Module for Developing Learning Media Applications for Wireless Networks in Project-Based Microtic Hotspot Materials for Microtic Setup (Configuration) Competency Improvement

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## 4 Module for Developing Learning Media Applications for Wireless Networks in Project-Based Microtic Hotspot Materials for Microtic Setup (Configuration) Competency Improvement

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**Abstract.** The objectives of this research are: (1) to implement project-based learning to improve student competence in setting up hotspot configuration on MikroTik according to Y generation characteristics; (2) to know the feasibility of M-netsys application through assessment instrument from Walker & Hess for media and RISTKDIKTI for materials with scale measurement using rating scale; (3) knowing student learning result after using M-netsys application with experimental model of one-shot case study. The research method used in this research is Research and Development (R & D) using One-Shot Case Study testing strategy with minimum learning completeness  $\geq 3.0$  or B. Stages of this research include (1) Analysis of potential and problem (2) Data Collection (3) Product Design (4) Design Validation (5) Design Revision (6) Product Trial (7) Product Revision (8) Test Usage (9) Product Revision (10) Mass Production. This research was conducted in 2015 Wireless Network class with 25 students. The results of the research have been obtained: (1) To improve student competence in setting (configuration) hotspot on MikroTik which according to Y generation characteristics can be done by implementing project-based learning in the learning process through the application of M-netsys learning media supplement. (2) The feasibility of M-netsys learning material with the research instrument from RISTEKDIKTI is stated very strong with the percentage of 84.4%. Meanwhile, the prevalence of M-netsys media through the assessment instrument of Walker & Hess is considered very strong with a percentage of 83.58%. (3) Students' learning outcomes after using M-netsys as many as 25 students completed and expressed classically with 100% percentage.

### 1. Introduction

The internet is currently needed to support human needs activities in the millennial era, directly or indirectly. There are many activities that can be carried out from learning to entertainment that can be accessed in real-time and directly centered. With internet access, everything can be done anytime and anywhere easily. According to Hootsuite's research with We Are Social, from data announced on January 26, 2017, Indonesia has 132.7 million internet users. Getting internet access is now very easy to obtain, such as companies, offices, cafes, coffee shops that provide internet access to homes that subscribe to access the internet.

The condition of the education system in Indonesia is considered still not ideal because it has not been able to answer the challenges of a competitive and complex future. From articles about the concept of education in Indonesia still lagging behind, according to Indra Charismiadi, education expert, "The development of the world of education is very fast, therefore Indonesia must adjust the curriculum in order to compete in the global era. Schools must be able to prepare students to face the real world that is full of problems to be ready in global competition, the STEM method invites students to integrate subjects and connect with everyday life. The learning process involves 7 main skills for 21st-century students, namely collaboration, creative, critical thinking, computerization, cultural understanding and



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independence in learning and career". STEM (Science, Technology, Engineering, and Math) is one of the most popular learning models in the world that is effective in helping the teaching and learning process that combines science, technology, engineering, and mathematics. Computational thinking has been prepared for schools in the country, not just learning to push buttons but learning to solve problems with technology or think like a computer.

According to the journal about "Paradigm in learning in higher education" by Suyanta, the learning conditions in higher education are still quite diverse. Even though learning has been based on learning outcomes, but from the experience of the Higher Education Curriculum Development Team, the Directorate of Higher Education conducted curriculum development training throughout KOPERTIS in Indonesia with the main problem, namely a lack of understanding of the essence of the curriculum in the Education system; lack of preparation of lecturers in preparing learning devices before conducting learning; unclear formulation of learning outcomes; unclear strategy and learning methods; unclear whether the choice of strategy and learning methods is the right choice to bring up the learning outcomes that have been set; assessment activities tend to score / value students rather than provide guidance to unlock their potential; instruments for assessment tend to characterize summative assessment rather than formative assessment. From some of these problems can be used as a reference to improve the learning process that is not good so that it can improve according to the desired learning outcomes.

In the journal "Integrated STEM Education through Project-Based Learning" by Diana Laboy-Rush there are several processes in integrating STEM education through project-based learning. Everyone is naturally involved in problem-solving. All use the tools and materials available to meet their needs. The ability to solve problems arises naturally. The project approach to STEM, or "learning by doing it," is based on constructivist theory (Fortus, Krajcikb, Derasherb, Marx, & Mamlok-Naamand, 2005) that is proven to improve student learning achievement in high-level cognitive tasks, such as scientific processes and solutions mathematical problems (Satchwell & Loepp, 2002).

There are many research-based approaches for integrated STEM education - for example, Design-Based Science (DBS) (Fortus, Krajcikb, Derasherb, Marx, & MamlokNaamand, 2005), Math Out of the Box <sup>TM</sup> (Diaz & King, 2007), Learning by Design <sup>TM</sup> (LBD) (Kolodner, et al., 2003), Integrated Mathematics, Science and Technology (IMaST) (Satchwell & Loepp, 2002), among others - all of which combine inquiry-based activity processes that encourage students to contextualize projects in relation to knowledge and experience, and to communicate what they learned as a result. Generally, each program directs students through a process of four or five steps, with each step achieving specific process-based goals. The following is a project-based learning process compiled from various project-based integrated STEM programs that are evaluated and proven to be effective STEM education programs, namely reflection, research, discovery, application, and communication.

The current generation of students is born in the midst of technological and information developments that are increasingly growing. Today's generation is very close to existing technological developments. Gadgets or technological equipment that is used as if - will be inseparable from every activity they do. This generation utilizes existing technological developments to get access to the information it needs quickly and accurately to support all its activities.

Today's generation has several different names, some call Net Generation, Millennial or Millennium, and Generation Y (McCrindle Research 2006). Nobody has definitely given a division about when this generation Y span is given; some studies indicate this dates back to 1977, some suggested in 1980 (Lancaster and Stillman 2002), and others said in 1982 (Wessels and Steenkamp 2009).

The learning process in the current generation is different compared to previous generations. Generation Y that is closer to the development of technology and information that has developed rapidly, allows the development of learning media in the teaching and learning process. With the development of learning media, it is expected to be able to help and provide convenience in handling the teaching and learning process for students and teachers.



From the research journal "Understanding and Teaching Generation Y" conducted by Peter Reilly, there are several aspects that are considered in the Y generation in understanding and teaching this generation. Y generation that is more multitask or can run multiple jobs simultaneously rather than just focusing on one thing at the same time. This generation can read, write, and do other activities at the same time by simply pressing what is needed on their gadget.

Educators have also discussed the nature of generation Y and the challenges they bring to class. It turns out, the old way to go to school, namely the teacher as a "wise person on stage", is not effective with generation Y (Skiba 2008). Teaching and methods in a long way, not in accordance with the learning conditions of students. Generation Y is currently closer to the latest and sophisticated technology, with the hope that teachers can adapt to the latest conditions. In delivering a material, a teacher usually provides material, references and demonstrates the steps of the material provided. This makes boredom and becomes unattractive to note. And what happens when students are given the task of making a report demonstrating themselves from the material that has been delivered, some students who do not understand become confused themselves. In practice in the industrial or work world, there are some things that are forgotten from the material that has been given by the teacher. They will look for references that some sources of information are uncertain and do not match the problem to be resolved. This makes work not easy and hampered.

Generation Y is reliable in tech-savvy. Today's generation is more comfortable with the presence of technology. Prensky (2001) refers to them as digital natives or people born in the world of technology. Generation Y is more familiar with computers, cellular telephones, and video games than the previous generation who are still migrating to technology that is currently developing. In other words, today's youth have never known life without computers and the internet, and therefore see information technology as an integral part of their lives. With this capability, they get the desired information quickly by using sophisticated applications or equipment.

Y generation individuals have kinesthetic characteristics and visual learning. Simulation from the real world invites and motivates generation Y who have visual properties and from the development of learning by doing it. By doing the learning process by doing things learned, attracting students who do not just learn the theory raw but they also try out what is taught. Habits and closeness in the use of current technology that displays visuals in the form of interesting images or animations that can clearly illustrate how they are interested in the picture.

Generation Y is more inclined to entertainment and games. Halvorsen (2008) writes that Generation Y listens to iPods on roller coasters because roller coasters aren't entertaining enough. He discussed the importance of entertainment as a motivating factor for getting students to come to class and remember what they learned. Interesting learning can be designed with entertainment and interactive games that are filled with material that will be learned through learning media. The Federation of American Scientists (2006) has described the value of educational games by identifying attributes that contribute to learning, such as providing clear goals, opportunities for adequate training, continuous feedback, and planning. The combination of the development of entertainment and games expected in this generation can enhance the fun learning process.

Generation Y is less and very poor at reading. Generation Y is more interested in things that display visually than textual and therefore shows a tendency to reduce reading. Today's generation is more often seen with an attractive visual display in the form of graphic design and animation of information presented on their sophisticated gadgets or devices, not in the form of the long boring text so that it is interesting to note.

The teacher pattern that can be taken from generation Y is how teachers can change the way traditional learning is done by learning the current generation that is closer to the latest technology. Teachers need to add more technology-based assignments, incorporate visual content, and provide opportunities to be active in the classroom. If students are not given many opportunities to take part in training and receive experiences in the form of responses, then the experience in the classroom is reduced compared to personal experience. Relationships between teachers and students become



weaker and interest in learning decreases. Teachers can make some planning or teaching strategies that need to be updated.

In conclusion from the research journal "Understanding and Teaching Generation Y", writers from various professions show that generation Y has values and needs that are different from previous generations. Teachers can benefit from the writers' insight into the needs of generation Y. These needs are related to their lives that can be adjusted, all-digital, and visually; feedback or response; reduce interest in reading; and their desire to make a difference. Looking at the characteristics of generation Y, teachers can understand nature and implement strategies or plans that are in accordance with generation Y.

The world of education today is also very influential with the world of work. Many companies, both State-Owned Enterprises (BUMN) and private companies are looking for employees with special abilities. With this, it can encourage vocational schools or universities to improve the quality of education.

The rapid development of technology also has an effect on life today. With the development of increasingly sophisticated technology, this can help human life. Humans today cannot be separated from modern and mobile technology or can be used at any time. Technology can also be developed into many things that can help facilitate daily activities.

Education and technological development are also inseparable. With the existing developments can improve how a teacher deliver material to students. With this, it can help in delivering well-packed learning material so that it can attract interest in learning a student.

The hotspot is currently very necessary and used for office, home, and cafe purposes, which are currently using MikroTik to connect to internet connections. Expertise in setting (configuration) hotspots in MikroTik is what is needed in the world of work or industry.

With the existing background, the handling and treatment of the Y generation of teaching and learning can be treated according to their characteristics. Attractive learning media supplements such as visuals and graphics, media used, providing concise and understandable information can be provided to improve student learning competencies.

With the M-netsys application, which was made to supplement wireless network learning media on hotspot material, it can help generation Y in the learning process that fits its characteristics.

## 2. Method

This study uses a quantitative approach using product-oriented research and development methods. The method used in the research is research and Development (R & D) which is a method for developing and testing a product (Borg, W.R & Gall, M.D. 2001). And in this study using the development of R & D from Sugiyono which is divided into 10 steps that have been developed. In this study using a One-Shot Case Study research design to test the student learning outcomes. The steps in R & D development research begin with the translation of potential and problems, data collection, product design, design validation, design revisions, product trials, product revisions, usage trials, product revisions, and mass products.

The data sources used in this study come from:

Name of Institution: Universitas Negeri Surabaya

Faculty : Faculty of Engineering

Department : Informatics

Study Program : S1 Information Technology Education

The population and samples taken for use in this study are as follows:

Population: Student of Information Technology Universitas Negeri Surabaya

Sample : Students in the odd semester period of the 2017/2018 school year S1 2015  
Information Technology Education class A takes courses in Wireless Networks

In this study using several instruments used to collect data. The following are the instruments used in the study:

- Media validation questionnaire instrument  
The media validation questionnaire instrument was prepared based on the opinions of Walker & Hess (Arsyad, 2013: 175-176) regarding the assessment criteria for learning media based on quality.
- The material validation questionnaire instrument  
The questionnaire validation material was prepared based on the Directorate General of Learning and Student Research, Technology and Higher Education regarding the quality of learning material.
- Learning outcomes assessment instruments

Instruments used in the assessment of learning outcomes based on competency indicators from the material contained in RPS Wireless Networks. The collected data is then analyzed to find out the results of the assessment. In this study using quantitative data analysis techniques because the data used is in the form of numbers. Quantitative data is obtained from media validation assessment by expert media learning experts, assessment of material validation by expert experts in learning materials, and assessment of student learning outcomes.

Data analysis techniques in material validation and learning media using quantitative descriptive techniques, which are accompanied by an overview of the suggestions that have been given by media experts and material experts to assist in improving the quality of the media made. The measurement scale used in this assessment is a Likert scale.

The following is the rating scale in the assessment of material and media validation.

Table 1. Validation Assessment

Category	Score
Very Good	5
Good	4
Good Enough	3
Poor	2
Bad	1

(Riduwan, 2004:87)

The results of the assessment of media experts and material experts can be analyzed by the following formula (Widoyoko, 2011: 237):

$$\bar{X} = \frac{\sum x}{N} \quad (1)$$

Information :

$\bar{X}$  = average score

$\sum x$  = total score

$N$  = the number of trial subjects

To find out the final results of media validation, a percentage technique is used in analyzing data using the following formula (Arikunto, 2010: 210):

$$P = \frac{\sum x}{N} \times 100\% \quad (2)$$

Information :

$P$  = Score presentation

$\sum x$  = Score obtained

$N$  = Maximum score

From the results of the percentage calculation, to determine the criteria for the validity of the research instrument, race against the following criteria table:

Table 2. Criteria for interpretation of media validation

Percentage	Category
------------	----------



0%-20%	Very Low
21%-40%	Low
41%-60%	Enough
61%-80%	Strong
81%-100%	Very Strong

To find out the student learning outcomes and calculate the value of each student from the assessment indicator can use the following formula:

$$Value = \frac{Points\ obtained}{Maximum\ Point} \times 100 \quad (3)$$

Student learning outcomes are said to be very good if 80% of the total number of students reaches a value of  $\geq 75$  in accordance with the minimum standard of completeness at the university for Wireless Network courses. If stated in values 1 - 4, the minimum standard of completeness of students is  $\geq 3.0$  with the value of letter B.

Table 3. Value conversion

Interval	Range of Numbers	Letter
$85 \leq A \leq 100$	4	A
$80 \leq A- \leq 85$	3.75	A-
$75 \leq B+ \leq 80$	3.5	B+
$70 \leq B \leq 75$	3	B
$65 \leq B- \leq 70$	2.75	B-
$60 \leq C+ \leq 65$	2.5	C+
$55 \leq C \leq 60$	2	C
$40 \leq D \leq 55$	1	D
$0 \leq E \leq 40$	0	E

To calculate the conversion value obtained each student can use the following formula:

$$Value = \frac{Student\ Score}{Maximum\ Score} \times 4 \quad (4)$$

To calculate the conversion value obtained each student can use the following formula:

$$p = \frac{\text{number of complete student task}}{\text{number of student in the class}} \times 100\%$$

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### 3. Results and Discussion

(5)

From this study produced a product of M-netsys learning media application which contained learning material and steps in Hotspot settings in MikroTik in the form of images and videos.

The following are the results of the display of M-netsys learning media applications:

At the beginning of opening this application, flash animations will appear that bring up some animated images. This flash display can be seen in Figure 1.





Figure 1. Flash page

After displaying the flash page, the display goes to the home page shown in figure 2. Users can use the button to go to the page that will be opened.

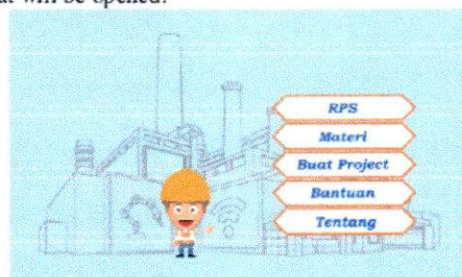


Figure 2. Home page

In figure 3, it is an RPS page that displays RPS from Hotspots.

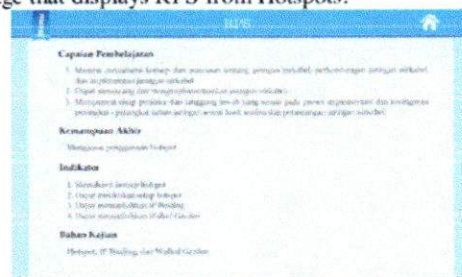


Figure 3. RPS page

In Figure 4, a page of learning material has two buttons to go to the Hotspot introduction and settings material page.

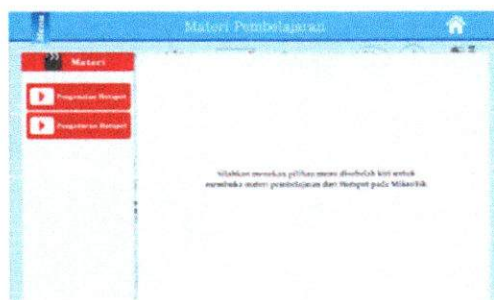


Figure 4. Material page

In figure 5, is a display of the Hotspot introduction material page that displays a short video of the learning material.



Figure 5. Hotspot introduction material page

In figure 6, a display of the Hotspot settings material page in the form of a short video that explains how to provide settings from the Hotspot.

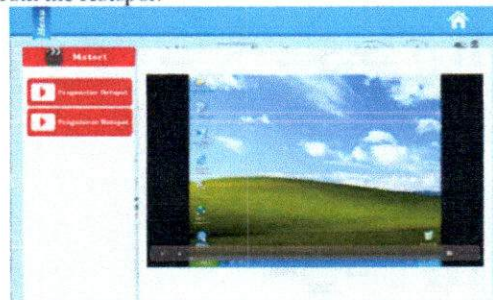


Figure 6. Hotspot settings material page

In figure 7, it is a project creation page, which has assignments to create a project. Can be continued by using the project select button.

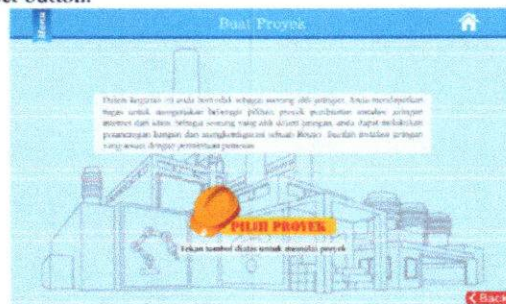


Figure 7. Create Project Page

After pressing the project select button, the next display will go to the project design page. On this page displays projects that can be done. In figure 8 is a display of the project design page.

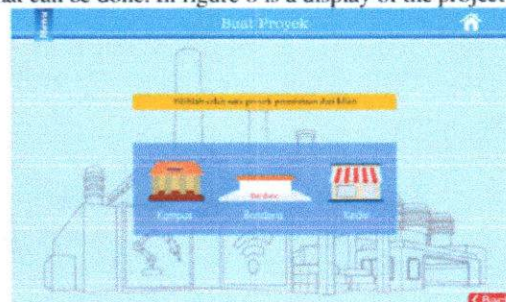


Figure 8. Project Design Page



In figure 9 is a page view of observations and problems that exist from one of the project designs that are done.

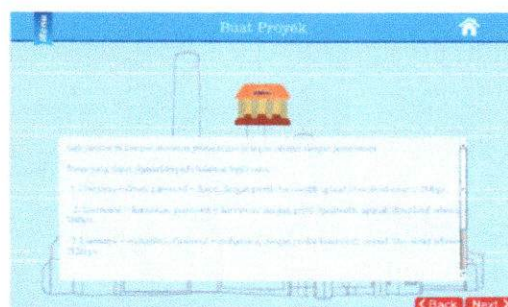


Figure 9. Observation and Problem Pages

After pressing the next button on the observation page and the problem will go to the work timeline page (figure 10) which shows the time needed for the project.

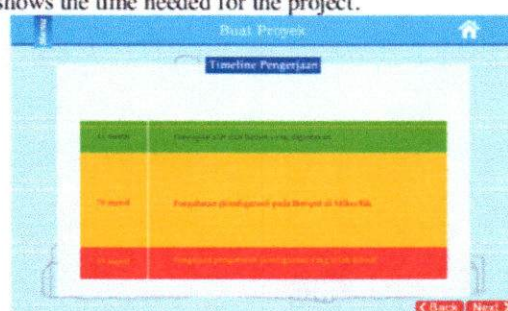


Figure 10. Work Timeline page

Press the next button to proceed to the tools page and the material needed in the settings in the proxy. Figure 11 is a display of pages of tools and materials.

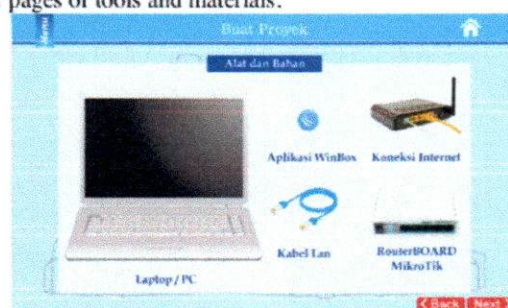


Figure 11. Tool and Material Pages

On the next page displays the network scheme of the project created. The Jaingan Schema page can be shown in figure 12.

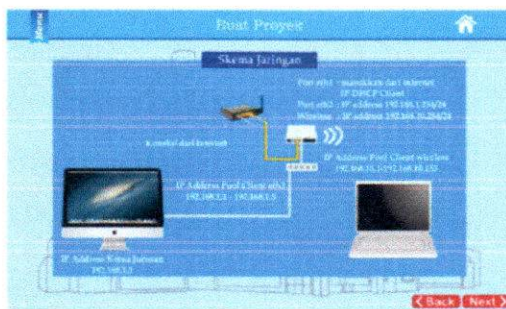


Figure 12. Network Schema Page

After pressing the next button on the network scheme page, then go to the settings page that contains the steps for setting up the Hotspot in MikroTik. The settings page is shown in figure 13.

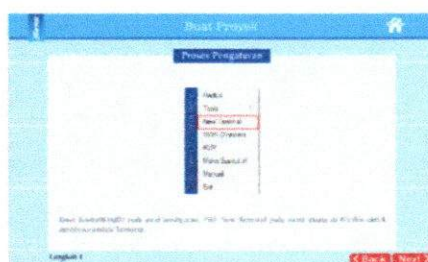


Figure 13. Settings page

After completing all the settings on the settings page, the next page will display the test page as shown in Figure 14.

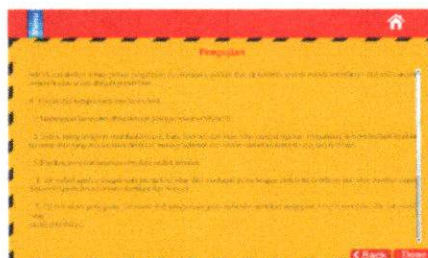


Figure 14. Test page

In figure 15 is a display of the help page that contains help using the application.

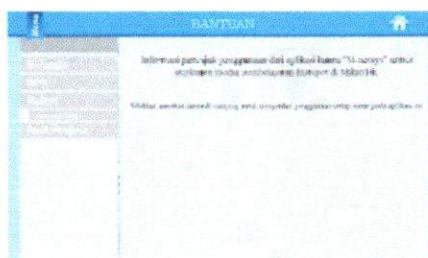


Figure 15. Help page

21 Figure 15. Help page

The results of the validation assessment of the material used in Wireless Network learning media were obtained at 84.4% with very strong criteria.



Table 4. Material Validation Assessment

No	Calculation	Aspect			
		All	Material	Presentation	Language
1.	Number of respondents	1	1	1	1
2.	Number of questions	9	3	3	3
3.	Maximum score	45	15	15	15
4.	Score obtained	38	12	13	13
5.	Average Score	4,2	4	4,3	4,3
6.	Percentage	84,4%	80%	86,6%	86,6%

The following are the results of assessments of media validation that have been assessed by experts with an overall final score of 83.58% with very strong criteria.

Table 5. Evaluation of Media Validation

No	Calculation	Aspect			
		All	Quality & Purpose	Intruksional	Technical
1.	Number of respondents	3	3	3	3
2.	Number of questions	13	5	5	3
3.	Maximum score	195	75	75	45
4.	Score obtained	163	63	62	38
5.	Average Score	4,17	4,2	4,13	4,2
6.	Percentage	83,58%	84%	82,6%	84,4%

And the following is the learning outcomes of students who have used learning media.

Table 6. Student Learning Outcomes

NIM	Student Score	Number	Letter
15050974002	93,75	3,75	A-
15050974004	93,75	3,75	A-
15050974005	93,75	3,75	A-
15050974006	93,75	3,75	A-
15050974008	93,75	3,75	A-
15050974010	93,75	3,75	A-
15050974011	93,75	3,75	A-
15050974012	93,75	3,75	A-
15050974016	75	3	B
15050974019	75	3	B
15050974021	75	3	B
15050974022	75	3	B
15050974024	75	3	B
15050974025	93,75	3,75	A-
15050974027	93,75	3,75	A-
15050974028	75	3	B
15050974030	75	3	B
15050974031	75	3	B
15050974032	93,75	3,75	A-
15050974033	75	3	B
15050974034	100	4	A
15050974037	93,75	3,75	A-

NIM	Student Score	Number	Letter
15050974038	93,75	3,75	A-
15050974040	93,75	3,75	A-
15050974041	93,75	3,75	A-

#### 4. Conclusion

Based on the results of the research that has been done, the conclusions from this study are:

(1) From the implementation results obtained, to improve student competency in setting (configuration) hotspots in MikroTik that are in accordance with the characteristics of generation Y can be done by implementing project-based learning in the learning process through the application of M-netsys learning media supplement.

(2) From the results of the feasibility of the M-netsys application, the feasibility of M-netsys learning material with research instruments from RISTEKDIKTI was stated to be very strong with a percentage of 84.4%. Whereas, the validity of M-netsys media through assessment instruments from Walker & Hess was stated to be very strong with a percentage of 83.58%.

(3) From the student learning outcomes obtained, student learning outcomes after using M-netsys as many as 25 students complete and are declared complete classically with a percentage of 100%. The hope is that this media can be further developed in animations such as those in the video explaining hotspot material or on the explanation of hotspot settings in MikroTik so that students can improve understanding of the material.

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