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IEEE

ISBN: 978-1-5090-2325-7

2016 isemantic

International Seminar on Application for Technology of
Information and Communication



PROCEEDING

Science and Technology for a Better future

1st International Seminar on Application for Technology of Information and Communication

**August 5th – 6th, 2016
Universitas Dian Nuswantoro
Semarang, Indonesia**

2016 International Seminar on Application for Technology of
Information and Communication
(ISEMANTIC)

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Semarang, Indonesia

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GREETINGS FROM THE GENERAL CHAIR

Greeting, conference participants!

Welcome to the 2016 International Seminar on Application for Technology of Information and Communication (ISEMANTIC 2016). On behalf of the conference committee, I would like to convey my appreciation to all authors for participating and contributing valuable works and efforts in this conference.

ISEMANTIC 2016 aimed to meet the demands of the academia, researcher and industrial society regarding the application of information technology and communication. Where I believe it is the most comprehensive conferences focused on science and technology for the better future. Furthermore, future ISEMANTIC will constitute a unique opportunity for academics and industry professionals to discuss the latest update and progress in the area of science and information technology. Therefore, we expect ISEMANTIC to become a significant milestone for further related research and technology improvements. Based on the results of the rigorous review process, 64 papers have been accepted out of 112 submitted papers, which constitutes acceptance rate of 57.14%

I would like to extend my special gratitude to the Keynote Speakers who have kindly agreed to support ISEMANTIC 2016.

- Prof. Nasir as a minister of research and higher education of republic Indonesia,
- Prof. Adang Suandi Ahmad from Institut Teknologi Bandung (ITB) Indonesia,
- Prof. Taufik from California Polytechnic State University USA
- Dr. Hector Sances Lopez from Universitas Dian nuswantoro Semarang Indonesia
- Also we would like special thanks to IEEE Indonesia Section for their technically support to our conference.

Furthermore, I would like to thank all oragnizer, supporters, and organizing committee members of ISEMANTIC 2016. The success of ISEMANTIC 2016 would not have been possible without their support and contribution, as I strongly believe their collaboration and support was invaluable to making this International Conference fruitful and insightful.

Lastly, I would like to thank you all and it would be my great honor and pleasure to have your continued contribution in future ISEMANTIC.

With warm regard



Dr. Pulung Nurtantio Andono, M.Kom

Vice Rector for Research & Collaboration
Universitas Dian Nuswantoro

GREETINGS FROM RECTOR

Greeting, conference participants!

Welcome to the 2016 International Seminar on Application for Technology of Information and Communication (ISEMANTIC 2016). In this beautiful day I welcome you to Semarang Indonesia the greatest city of central Java. As a rector of Universitas Dian Nuswantoro I am extremely impressed with the dedication and enthusiasm of the conference organizing committee members. I congratulate all of them for the team effort that is adding to the success of the conference.

We couldn't be happier to have Prof. Nasir as a minister of research and higher education of the Republic of Indonesia, Prof. Adang Suandi Ahmad from Institut Teknologi Bandung (ITB) Indonesia, Prof. Taufik from California Polytechnic State University USA and Dr. Hector Sances Lopez from Universitas Dian Nuswantoro Semarang Indonesia.

Also I would like to deliver my best greeting to all authors and participants of the 2016 International Seminar on Application for Technology of Information and Communication. The 2016 ISEMANTIC focuses on science and technology for a better future. Since science, information technology and communication develop rapidly in the present day, I believe it could be the indicator of the glory of humankind.

Therefore, personally I put my best wishes to all of you as academia, researchers and industrial society to inspire and take a look closer to the real world through research in science and technology application. I hope all of us could aim for our best future and God bless us!

Lastly I would like to thank you all and it would be my great honor and pleasure to have your continued contribution in future ISEMANTIC. I sincerely hope that you will have a memorable experience in 2016 ISEMANTIC and have a good time in Semarang Indonesia.

With warm regards,



Dr. Ir. Edi Noersasongko, M.Kom.

Rector

Universitas Dian Nuswantoro

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GENERAL INFORMATION

VENUE

Conference Venue

ISEMANTIC 2016 will be held in Universitas Dian Nuswantoro, Semarang, Indonesia. It is placed on Building E (Gedung E) 3th Floor of the University Campus.

All sessions will take place in the Faculty of Computer Science that are at the fourth (4th) Floor of Building D (Gedung D).

Address



Building E (Gedung E), 3th Floor, Kampus II Universitas Dian Nuswantoro

Jalan Nakula I No 5-11, Semarang Indonesia 50131

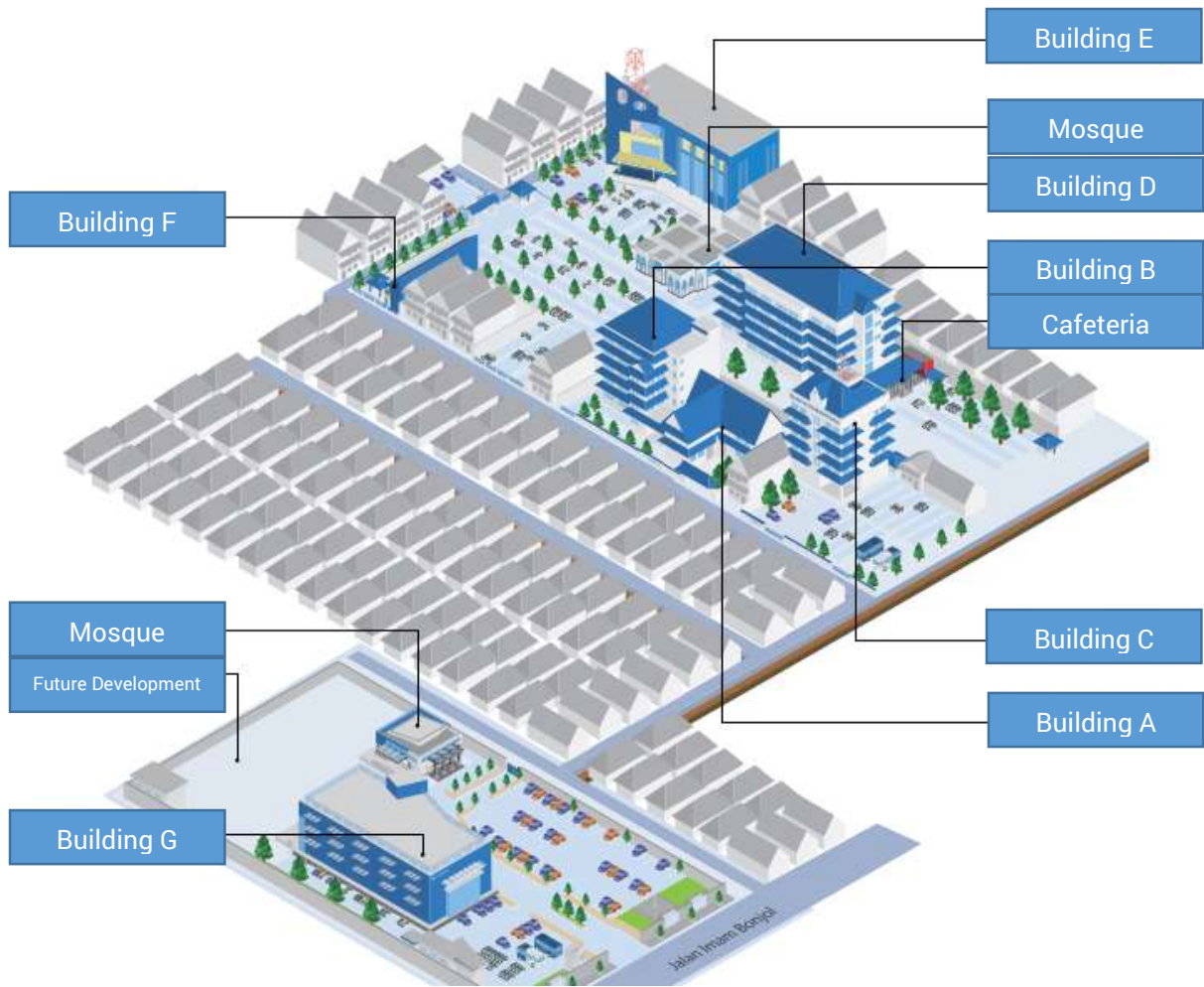
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MAPS

G.P.S. coordinates: Lat. -6.98 | Long.110.40



ISOMETRIC MAP



KEYNOTE SPEAKER 1

Prof. M Nasir, PhD

Minister of Research and Technology and
Higher Education of Republic of Indonesia



Biography

Prof. M Nasir, PhD is a minister of research and higher education of Republic Indonesia. He is former rector of Universitas Diponegoro in Semarang, Indonesia. He leads the new ministry which is a combination of the Ministry of Research and Technology and Directorate General of Higher Education. He achieved his doctoral degree in University of science in Penang, Malaysia. As the Minister of Higher Education Research and Technology, he was committed to make Indonesian higher education research able to competes with advanced nations in the world. The president of Republic Indonesia has been appoint him as Minister of Research and Technology and Higher Education for 2014-2019 period.

Prof. Adang Suwandi Ahmad

Professor at Sekolah Teknik Elektro dan Informatika (STEI), Institut Teknologi Bandung Indonesia



Keynote Title:

Brain Inspired Soft Computing for Advancement of Artificial Intelligence

Biography

Dr. Adang Suwandi Ahmad is a Professor of Intelligent Electronics Instrumentation System in the School of Electrical Engineering and Informatics at Institut Teknologi Bandung (ITB), Indonesia. He received his BS in Electrical Engineering from Institut Teknologi Bandung in 1976, Diplome Etude Approfondi Signaux et Bruits (DEA) option Electronique in 1978, and Docteur Ingenieur Signaux et Bruits option Electronique (Dr.-ing) from Universite des Sciences du Languedoc Montpellier in July 1980. Professor Adang areas of expertise are in intelligent electronic instrumentation for instrumentation devices and computational intelligence. His research activity currently focuses on Bioinformatics Computation, Information Sciences, and Intelligent-based Systems.

Prof. Taufik

Director of Electric Power Institute at California Polytechnic State University, San Luis Obispo,



Keynote Title:

Intelligent Systems In DC House For Residential Electricity

Biography

Educational Background:

- Bachelor of Science, Electrical Engineering & Minor in Computer Science
Northern Arizona University, May 1993
Graduated with Honors (Cum Laude, Tau Beta Phi, Phi Kappa Phi)
Final Project: Piezoelectric Amplifier for Telescope Viewing Stabilization
- Master of Science, Electrical Engineering and Computer Science
University of Illinois at Chicago, May 1995
Thesis: Theory of Rectangular Waveguide Filled with Bianisotropic Material
- Doctor of Engineering, Electrical Engineering
Cleveland State University, May 1999
Emphasis: Power Electronics, Power Systems, and Controls
Dissertation: Parallel AC-AC Converters with Master/Slave Control

Research Background:

Dr. Taufik is a Professor of Electrical Engineering and the Director of Electric Power Institute at California Polytechnic State University, San Luis Obispo, USA. He received his BS from Northern Arizona University, MS from University of Illinois at Chicago, and Doctor of Engineering from Cleveland State University, all in Electrical Engineering. Since joining Cal Poly he has received numerous teaching awards, most notably the 2012 Outstanding Teaching Award from the American Society of Engineering Education (ASEE). He is a senior member of the Institute of Electrical and Electronics Engineering (IEEE) with expertise in power electronics, power systems, and renewable energy. He has work and consulting experience with several world-class companies. His current project is the DC House Project for rural electrification which has received supports from several partners in Indonesia, Philippines, and Malaysia.

Major Concerns:

Power Electronics, Power Systems and Protection, Smart Grid, Renewable Energy, Power Quality

Dr. Hector Sanchez Lopez

Gradient Coil Architect,
Lecturer in Biomedical Engineering at
Universitas Dian Nuswantoro



Keynote Title:

Electromagnetic and Therapy for Alternative Medicine

Biography

Dr. Hector Sanchez Lopez has expertise in the Biomedical Engineering field with specialty in MRI (Magnetic Resonance Imaging) Gradient Coils. He achieved his PhD in Biomedical Engineering from University Claude Bernard Lyon1, France. Presently, he is a Managing Director in Nanjing Cichen Medical Technology in Nanjing, China. He has published more than 30 papers in international journals and 49 in conference proceedings, and has been awarded 5 patents in biomedical engineering. Tesla and General Electric Health care are among world class companies that invited him for collaboration for his work in biomedical engineering. He is currently a lecturer in Biomedical Engineering at Universitas Dian Nuswantoro, Semarang, Indonesia.



PAPER PROCEEDING

Developing Educational Game for Collaborative Learning

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Abstract—Nowadays, conventional methods of learning are no longer enthused by students, because a one-way teaching method makes students easily bored. Collaborative learning methods are used to make students more interested in learning and encourage students to actively contribute to the classroom session. One of the benefits of collaborative learning as a learning method is that it allows each student in a group to actively contribute and share their ideas. An example of collaborative learning implementation in the classroom is computer-supported collaborative learning (CSCL). CSCL is a type of collaborative learning technique in which students can learn a subject matter with their peers using computers. Such strategies could be implemented in the form of digital games to make the collaborative learning methods more attractive and interactive. This paper attempts to investigate students' perception toward the collaborative task of designing a game in a language classroom. Overall, the findings suggest that students showed positive attitude towards the task because it allowed them to understand the subject matter better.

Keywords— *collaborative learning; digital game; game design; educational game; mobile application*

I. INTRODUCTION

Science plays a vital role in developing social and economic status worldwide [1]. The advancement of science and technology brings the global society to prosperity. The strategy to master advanced science and technology is to educate people to become excellent human resources that can compete internationally[2].

Indonesian government enacted Law No. 20 of 2003 on National Education System, therein described the meaning of education in paragraph 1 of Article 1, which states "Education means a conscious and well-planned effort in creating a learning environment and learning process so that students will be able to develop their full potential for acquiring spiritual and religious strengths, develop self-control, personality, intelligence, morals, noble character and skills that one needs for him/herself, for the community, for the nation, and for the State." [3]. The law clearly encourages students to actively develop their potential in order to better understand what they learn. The teaching and

learning strategies should be well designed in order to create well rounded students.

In Indonesia, the teaching and learning approach, especially in K-12 settings, is mostly based on grades. Teachers and parents pay more attention to grades instead of the actual learning process. Students learn course contents by rote memorization[4]. 2013 educational curriculum was designed as an attempt to change the educational paradigm, but it was not popular among K-12 teachers and policy makers. In higher education institutions, however, the teaching and learning paradigm is slightly different from that in K-12 education because teachers have more freedom to determine the most appropriate teaching strategies that can sharpen students' critical thinking skills.

Many university teachers adopt active learning strategies so that students become more creative, innovative, and engaged. Some of the methods that teachers often use are collaborative and cooperative learning. Cooperative learning refers to a teaching method in which students divide tasks among group members, whereas collaborative learning is a learning method in which each student contributes their skills and strengths to accomplish a task together. These methods can be combined to obtain the best learning experience. Teachers use various tools including digital media, which was known as computer-supported collaborative learning (CSCL). CSCL is a type of collaborative learning technique in which students can learn a subject matter with their peers using computers [5].

With CSCL, teachers can also create digital games to increase student engagement and attract students' interest. Digital games can be used not only for entertainment, but also as an interactive, unique, and effective learning media [6]. Salen claims that the use of games in education is acceptable as long as the games are "rich with data". A good educational game is one that has a lot of instructions for players such as how to play the game, what players should do to complete the game, how they get points or bonuses, and so on [7].

The growth of computer technology and its increasing number of users, particularly for mobile devices or smartphones worldwide, has been predicted to exceed two billion in 2016. The results of the survey firm eMarketer showed that smartphone users increased by 12.6% from 2015, from 1.91 billion to 2,16 billion [8]. This has created greater opportunities for creative industries based on games. Anyone who has an interest in computer games, including teachers and lecturers, has the opportunity to be involved in the development of educational games. Teachers have the knowledge and experience, based on their respective fields of study, which they can use to develop the content of educational games [9].

Recent literature also indicates that games are used mostly by users of gadgets or mobile devices; thereby educational games have a potential to be incorporated as a media of collaborative learning methods [10]. Games can be used and integrated in the teaching and learning process. However, teachers need to select the most appropriate games if depending on students' technological comfort level, students' interest and abilities, subject matters, and goals of the course. [11].

Meta-analysis studies on the effectiveness of serious games for learning reveal mixed results. However, serious games do have positive effects on motivation and class engagement [12]. Piirainen-Marsh and Taino (2009) examined how their research participants engaged and interacted when playing the game. They found that games provided ample interactional opportunities when they played the games. Game based learning approach, in addition, can promote students problem solving skills and increase learning motivation [13].

Previous studies on serious games focused more on the ready to use games. The participants were tested as the users of games. In this study, however, the researchers would like to use games as a tool to work collaboratively. In other words, the participants in this study were asked to design a game and create activities and exercises in a collaborative manner for other people to use.

The researchers conducted this study to explore how a certain type of game, in this case a role-playing game (RPG), is integrated to make students more engaged through collaborative learning. More specifically, this study wants to address the following research questions: (1) How do students perceive the collaborative task of designing a game to create activities for classroom use? (2) How do they perceive the usefulness of the task to learn subject matters? (3) Are students interested in developing a game for classroom use?

II. THEORETICAL FOUNDATION

2.1. Education

According to John Dewey, in his book entitled "Experience and Education", education is a preparation [14]. This means that education is a form of gaining experience which is then used as stepping stones for future achievements. Moreover, he claims that one can attain

future goals if he possesses experiences and understands the consequences of their decisions. In consideration of the skills possessed by students to be educated as citizenship, vocational, for leisure; then taught reading, arithmetic, geography recognize due to be useful for them in social life.

For Dewey, education is always evolving. It never ends. Education should be participatory, democratic, pluralistic, and liberal. [15].

The Indonesian model of education emphasizes the importance of having well-rounded citizens. Law No. 20 of 2003 on National Education System stipulates that the purpose of education is to create students who possess great potentials for the greater good. In addition, the Preamble of the Indonesia 1945 Constitution underlines the guidelines for the nation's intellectual life. It highlights the importance of Indonesian citizens to possess intellectual, emotional, and social intelligence. [16].

2.2. Collaborative learning method

The learning method is a systematic plan to achieve set learning objectives through appropriate steps. It refers to a series of related and progressive actions carried out by teachers and students [17]. There are three basic methods of teaching: teacher-centered, learner-centered and focus-centralized [17]. Each method has advantages and disadvantages. Teachers can modify or even combine one or more of the methods in order to achieve the goals of the course. The methods and strategies used by the instructor in the classroom can thoroughly teach many things so that students understand the purpose of dealing with different situations or problems in daily life [17].

There are several methods of teaching that increase student engagement. They are cooperative learning, collaborative learning, problem-based learning, inquiry-based learning, peer learning and team learning.

Collaborative learning is one method of active learning registered in GAISE (The Guidelines for Assessment and Instruction in Statistics Education) of the ASA (American Statistical Association) in 2010 (recommendation number 4) which states that [18]:

"Using active learning methods in class is a valuable way to promote collaborative learning, allowing students to learn from each other... Activities offer the teacher an informal method of assessing student learning and provide feedback to the instructor on how well students are learning. It is important that teachers not underestimate the ability of activities to teach the material or overestimate the value of lectures, which is why suggestions are provided for incorporating activities, even in large lecture classes." (p. 18)

Collaborative learning is a learning process whereby every group member contributes ideas, information, experiences, skills and ability from one to another to increase awareness amongst the members of the group [4]. Collaborative learning requires collaboration of each group member in the learning process to achieve a common goal. In a collaborative learning method, students learn from one another. They contribute their ideas equally. [19].

Collaborative learning is a significant shift from a process-centered teaching or teacher-centered classroom. In a collaborative classroom, lecturing may not disappear completely. Lecturing is usually used together with other methods such as class discussion, paired work, and many other methods. The most important goal of collaborative learning is to make students learn the subject matter more actively in order to improve knowledge retention. In the collaborative learning classroom, teachers are no longer the transmitter of knowledge. Instead, they become designers of intellectual experience. [20].

The following four characteristics underscore the basic assumptions of collaborative learning [20]:

1. *Learning is an active, constructive process*: learning is active and constructive process in which students learn new information, ideas or skills.
2. *Learning depends on rich contexts*: learning is fundamentally influenced by the context and the activities in which it is embedded.
3. *Students are diverse*: diverse students bring some new views or perspectives based on their background, experience, learning method, and their opinions.
4. *Learning is inherently social*: collaborative learning generates intellectual synergies to solve a problem through interactions with other group members.

III. METHODS

In this study, the researchers employed closed and open ended questionnaires in elicit responses. The questionnaires were distributed to 47 students consisting of freshmen, sophomores, juniors, and seniors in the Faculty of Language and Arts Soegijapranata Catholic University, Semarang, Indonesia who were taking Structure 1 course. The researchers used convenient sampling to collect data. Students who agreed to participate in this study were given a workshop to create a game using game engine called RPG Maker MV. These students did not major in computer science, because this research focused on the enthusiasm in learning new material from non-computer science students who were taught by a lecturer using collaborative learning methods that applied game development.

Since students did not major in computer science, RPG Maker MV was selected. In addition, the researchers created a template that students can readily use to create activities and exercises in the game. It is expected that by providing a template, students could put more attention into creating activities and role plays.

The questionnaire consisted of three parts. The first part was to elicit background questions such as inquiring gender and class. The second part consisted of 15 closed-ended questions with five response options. The last part consisted of three open-ended questions.

The questions were designed to find out students' perceptions of the collaborative task of designing a game in a language classroom and their interests in creating similar educational games.

This study uses descriptive statistics in the form of percentages to present the findings.

IV. SURVEY RESULTS

To address the research questions, the researchers asked several questions related to the task of designing the game and the exercises and their interests. When asked whether students liked creating games collaboratively, the findings indicated that 53% of the respondents liked to create games collaboratively very much, 38% liked it, 7% of the respondents reported that they felt neutral about creating games collaboratively, and the rest, 2%, did not like it at all (see Figure 1)

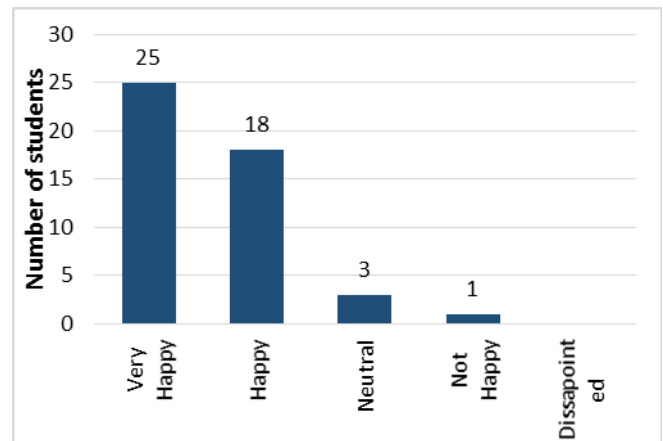


Figure 1. Students' opinions about creating games collaboratively

Figure 2 below shows students' response about the task of creating question items for the games. 26% of the respondents said they were very interested. More than half of the respondents, 55%, were interested in designing questions for the game. 17% said that they felt ambivalent and 2% said they were not interested.

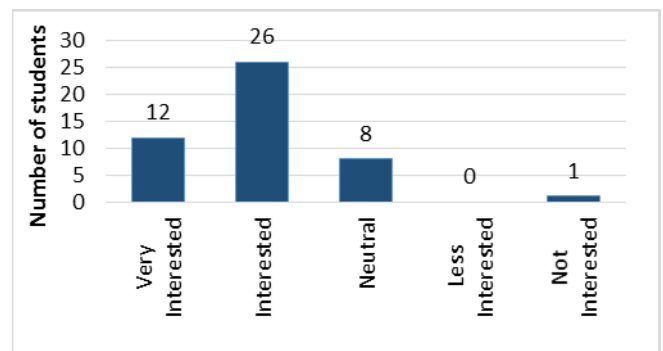


Figure 2. Students' opinions about designing questions for the game

When asked about the level of difficulty in creating the game, 17% of the respondents felt that the process was very easy. Slightly less than a half, 40%, of the respondents said that it was easy. However, 43% of the respondents felt that developing the provided games was neither easy nor difficult (see Figure 3).

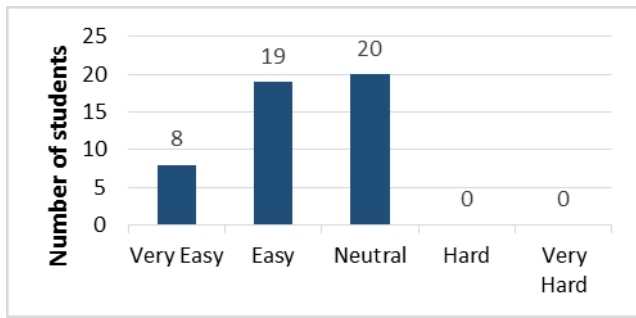


Figure 3. Students' opinions about the level of difficulty in making the game

The responses to asking opinions about the usage of the templates to assist in game development are shown in Figure 4. More than a third, 35%, responded that the template was very helpful. Slightly more than a half of the respondents, 56%, said that it was helpful. The remaining 9% said that it was neither helpful nor useless.

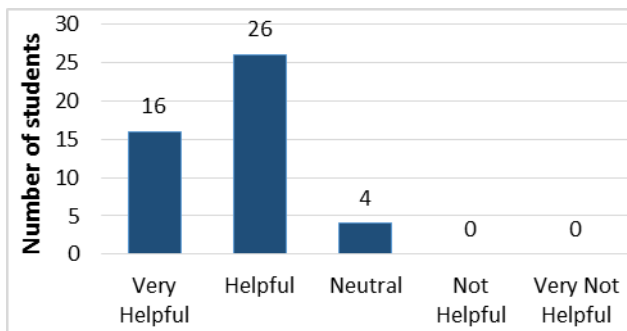


Figure 4. Students' opinions about the usefulness of the template to assist students in game development

As displayed in figure 5, most participants of this study, 89%, had positive attitude towards the idea that games can be used to study a subject matter collaboratively. Only 9% disagreed and 2% of them strongly disagreed.

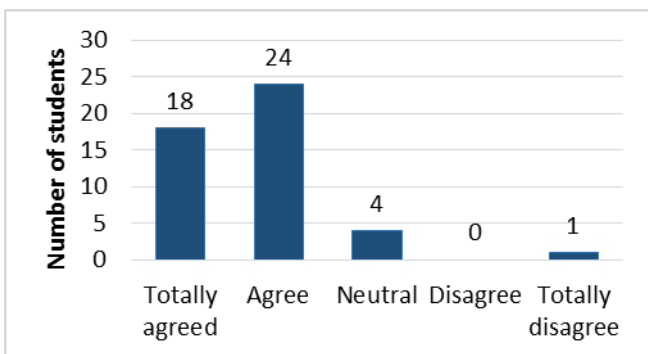


Figure 5. Students' opinions about whether games can be used to study a subject matter collaboratively

Figure 6 shows students' response for the question whether students are interested in creating a game with different topics, one fifth of the respondents reported that they were very interested and 49% said they were interested in creating more games with different topics. Less than one

fifth, 17%, answered neutral, and the remaining, 13%, said not interested.

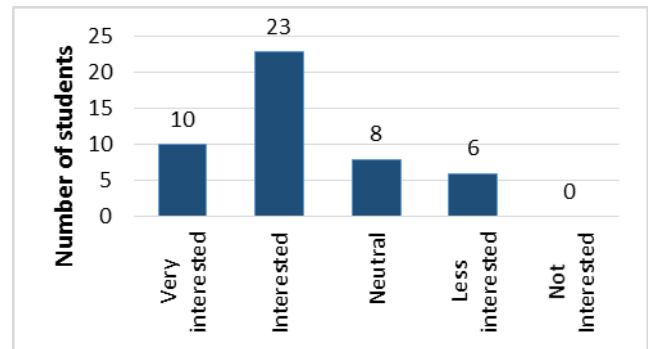


Figure 6. Students' opinions about their interest in creating a game with different topics

Statements shown in figure 7 found out whether the participants were excited for making games collaboratively. The findings show that 30% of the respondents felt very excited and 40% of respondents felt excited. 28% of them said they felt ambivalent. Only 2% responded less excited.

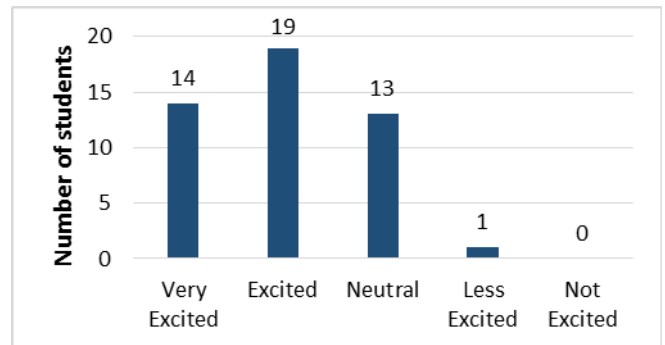


Figure 7. Students' opinions about their interests in making games collaboratively

When asked whether the need to learn a subject matter is fulfilled by developing a game, one tenth of the respondents strongly agreed. More than half of them said that the need was met. 34% said they felt neutral. Only 2% of the respondents disagreed that the game met their needs to learn a subject.

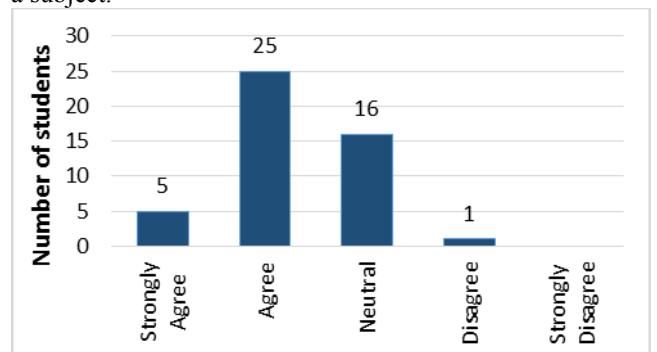


Figure 8. Students' opinions about whether a game meets their needs for learning a subject

Figure 9 shows the responses concerning whether respondents liked creating a game collaboratively. 15% of

respondents were very interested and 49% of respondents were interested in making games. While 23% of respondents responded if they taught how to develop the game for learn together is mediocre, and 13% responded the less interested.

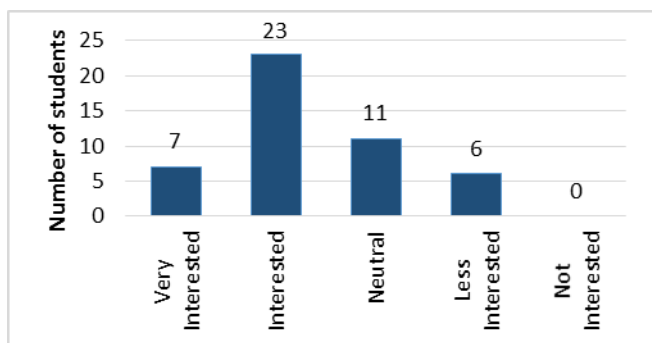


Figure 9. Students' opinions about interest in creating a games for collaborative activities

17% of respondents were very interested and 53% of respondents were interested to share the games that they created for others. However, 26% of respondents said that they were ambivalent, and 2% were not interested.

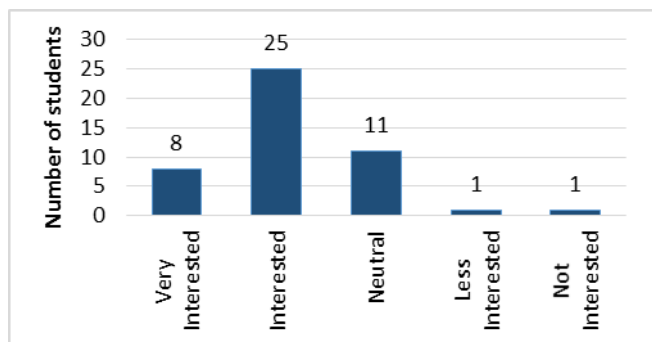


Figure 10. Students' opinions about interest to share games that they have been made to others

When asked about the usefulness of the game they created for other learners, 17% of respondents said it was very useful, 47% responded that it was useful. Thus, more than half of them showed positive attitude towards the inquiry. 32% of them said they were neutral and only 4% felt that the game was not useful for other learners.

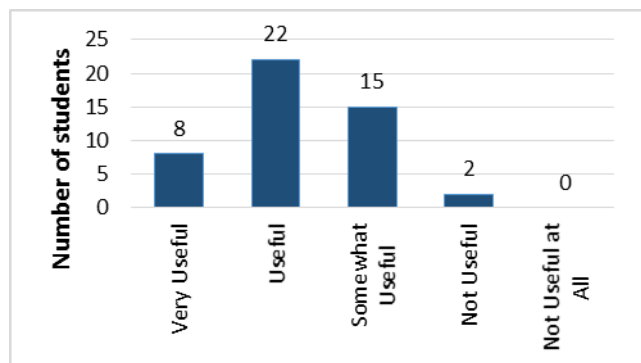


Figure 11. Students' opinions about whether the game they created could be used by others

Figure 12 shows the responses for when asked whether they agreed if the game could be played on a tablet or smartphone. More than 80% of the respondents said they agreed. One tenth of them said they were ambivalent.

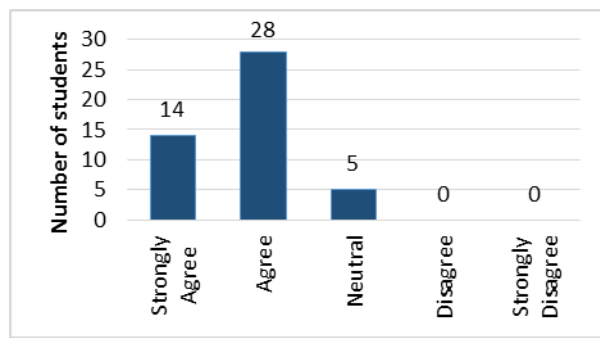


Figure 12. Students' opinions about whether a game could be played on a tablet or a smartphone

Figure 13 shows students' responses when asked whether the use of cartoon characters in the game is an attractive idea. It is described in the figure that almost all respondents expressed positive attitude toward the use of cartoon characters in a game (89%). The remaining 11% said they were ambivalent about the question.

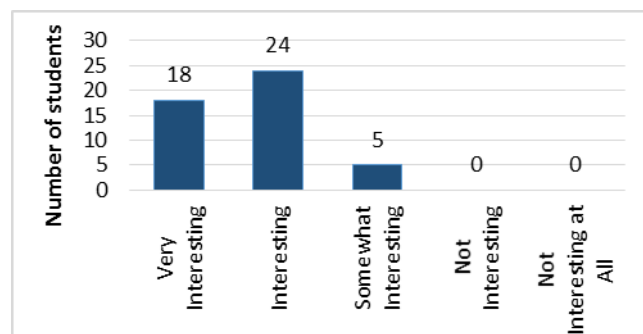


Figure 13. Students' opinions about the attractiveness of the cartoon characters in the game

Respondents were asked whether the game they created was interesting. Figure 14 shows the results of this question. The figure presents that 21% of respondents said it was very interesting, 60% responded that it was interesting. 19% of them said they were neutral about it.

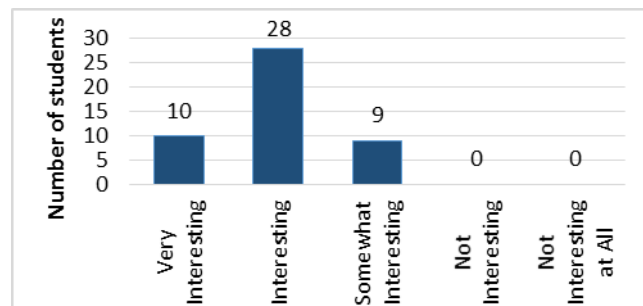


Figure 14. Students' opinions about their interests in playing Role Playing Game (RPG)

In response to the final survey question, three fourths of the respondents said they were interested to learn how to create different kinds of games, while the rest had more negative attitudes towards the statement.

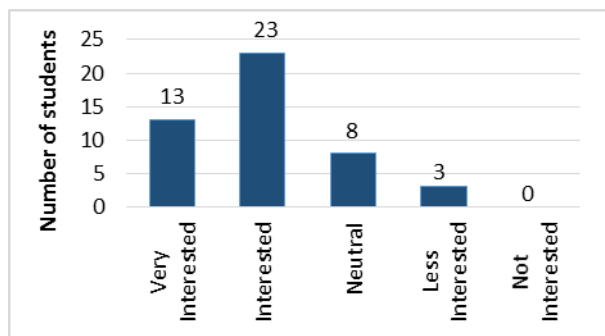


Figure 15. Students' opinions about their interests to learn how to create different kinds of games

In the third part, the open ended questions, the researchers asked about the challenges of creating the games, the weaknesses of the game, and the kinds of games students perceive would work for collaborative learning strategies. The data indicate that students' difficulties were more related to the technical issues and their familiarity with game making. Students stated that the games would have been more attractive if the characters and the maps had been more varied. Games such as SIMS or Harvest Moon could be some of the options that are feasible to be implemented in collaborative learning classroom.

V. CONCLUSION

The findings of the study indicated that students who are not majoring in computer science or not familiar with game design can create a simple game for collaborative learning. Most respondents showed positive attitude towards the use of games to learn a subject matter collaboratively. The findings revealed positive attitude towards the task of creating games for classroom use. With 45% said very happy and 38 % said happy, they believed the use of games will make learning become more fun. They were very excited about creating questions for the role play. It's proved with respondents said 55% excited and 26% very excited.

Ready-to-use template was helpful since they could easily modify the games. In other words, the template provides a solid basis for students to start developing the game. Even though a few students had difficulties with the technical aspects of creating a game, they viewed the task as very interesting and useful for them. This is understandable because participants are non-computer major. Respondents said they were confident that the use of games will help them learn materials better and eventually make them better learners.

ACKNOWLEDGMENT

This paper is a part of a research project funded by the Indonesian Directorate General of Higher Education in the

year 2016 under the scheme of International Collaboration and Publication grant.

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