

Optimising the utilisation of computer-based technology through interactive multimedia for entrepreneurship learning

Roemintoyo Roemintoyo^{a*}, Sebelas Maret University, Surakarta, Indonesia, <https://orcid.org/0000-0003-1152-1226>

Noor Miyono^b, University of PGRI Semarang, Semarang, Indonesia, <https://orcid.org/0000-0001-6434-6471>

Ngurah Ayu Nyoman Murniati^c, University of PGRI Semarang, Semarang, Indonesia, <https://orcid.org/0000-0002-4077-0961>

Mochamad Kamil Budiarto^d, Invada Cirebon Language and Education Institute, Cirebon, Indonesia, <https://orcid.org/0000-0002-1028-2860>

Suggested Citation:

Roemintoyo, R., Miyono, N., Murniati, N. A. N., & Budiarto, M. K., (2022). Optimising the utilisation of computer-based technology through interactive multimedia for entrepreneurship learning. *Cypriot Journal of Educational Science*. 17(1), 105-119. <https://doi.org/10.18844/cjes.v17i1.6686>

Received from October 01, 2021; revised from November 04, 2021; accepted from January 05, 2022.

Selection and peer review under responsibility of Prof. Dr. Huseyin Uzunboylu, Higher Education Planning, Supervision, Accreditation and Coordination Board, Cyprus.

©2022 Birlesik Dunya Yenilik Arastirma ve Yayıncılık Merkezi. All rights reserved.

Abstract

ICT-based learning media innovation is very relevant to support the learning process. Therefore, this study aims to develop interactive multimedia products that are suitable for use in learning activities. The method in this research is research and development (R&D) which adopts the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. The data collection technique used was a non-test technique, with a variety of instruments at each stage. At the analysis stage we used an observation sheet and a needs analysis questionnaire; at the design stage we used a document study and then at the development and implementation stage we used a multimedia feasibility questionnaire for media experts, teachers and 54 students. The results showed that during the learning process the teacher was not optimal in utilising ICT-based media; students strongly supported the development of interactive multimedia, which was good, followed by several suggestions for improving product quality. Overall, the interactive multimedia is included in the appropriate category as an instructional media.

Keywords: multimedia, feasibility, vocational high school, learning activities, interactive, Computer;

* ADDRESS FOR CORRESPONDENCE: Roemintoyo, Sebelas Maret University, Surakarta, Indonesia
E-mail address: roemintoyo@staff.uns.ac.id

1. Introduction

Learning in this era is very identical with the use of technology, as students at almost every level of college tend to be accustomed to the use of technology, without the exception of the use of technology in learning activities. 21st-century competencies are some of the important competencies for students to master and must get their attention so that they are able to face challenges while living in the community (Wijaya et al., 2016). Recent studies have shown that, in this era, entrepreneurial competence is an important competency to be mastered by individuals to support business activities and for the country's economy improvement (Abdillah & Sakapurnama, 2017). Curriculum implementation in Indonesia in general has accommodated the goal of achieving various competencies that must be mastered in the 21st century, one of which is entrepreneurial competence, where at the high school level there are crafts and entrepreneurship subjects. This is one of the efforts made by educational institutions in order to create young entrepreneurs who have high competence, creativity and innovation. In addition, the subject of 'Crafts and Entrepreneurship' has the aim of fostering an entrepreneurial spirit or entrepreneurial attitude in students through learning activities that train, manage work creation (production) and sell businesses (Lounsbury et al., 2019).

However, it should be borne in mind that the successful implementation of entrepreneurship education packaged in craft and entrepreneurship subjects at the high school level cannot be separated from several contributing factors. The results of the research conducted by Dzulfikri and Kusworo (2019) revealed several factors that influenced the entrepreneurial attitude of students, namely the ability to capital and the desire from within for entrepreneurship. In addition, factors that influence the formation of attitudes are the environment, personality, goals, individual competencies and strategies in running a business (Saputro et al., 2016). From these factors, the use of the environment is important in this learning because entrepreneurial attitudes can be developed with entrepreneurial actions. The simple and easy thing that can be done is to use the environment around students to work and be an entrepreneur.

In the era of technology-based education as it is today, the implementation of education cannot just run as usual; breakthrough innovations are needed that are able to create a dynamic and constructive learning climate through collaboration between cognitive abilities and skills (Aidarbekova et al., 2021). The national education system needs to prepare a more innovative learning system in order to improve the ability of graduates with 21st-century skills and so the implementation of learning must lead to mastering the competencies needed (Zubaidah, 2018). Among the competencies needed in the 21st century are 4C, critical thinking, creativity, collaboration, communication (Boyles, 2012; Christian Pilarta Oliquino, 2019; Rusdin, 2018), the use of information and communication technology to create an innovative and an active and interesting learning process (Ghavifekr & Rosdy, 2015).

Integrating ICT in the implementation of learning is one of the simplest ways to keep up with the times (Valtonen et al., 2019). Computer-assisted instruction (CAI) can be an alternative for implementing technology integration into learning activities (Witte et al., 2015). CAI makes it easy for students to study topics or subject matter consistently with their learning styles (Ishaq et al., 2020). Thus, teachers are required to be able to take advantage of the learning media that have been integrated with technology as an innovation in creating conditions and a learning environment that are conducive to achieving learning goals (Kali et al., 2015; Marta, 2019). This cannot be separated from the indication that the success of the implementation of learning is basically influenced by

several factors, including student activity, the availability of learning facilities and teacher management, in the learning process and the use of learning media (Bayne, 2015; Shatri, 2020).

Teachers can seek to design and create media for their own learning process based on the characteristics of their students. The use of teaching materials designed in the form of certain media which are then used in the learning process will be able to provide a positive stimulus to students (Tukenova et al., 2019), so that students will be motivated and interested, and it will even have a psychological impact on student learning interest (Sugiyati, 2016). The attainment of information or subject matter that is first designed and packaged into a particular type of learning media will have an impact on student learning outcomes (Kapi Kahbi et al., 2017; Sung et al., 2016), so that as a one of the important learning components of the learning process, learning media has a role to contain information or material in the form of print, audio, visual or image media and multimedia in the learning process (Abidin, 2016; Tafonao, 2018). The learning process that utilises the media as a means of sending learning information will be able to help students master the understanding of a concept that is being studied. This is because through learning media the information conveyed becomes more interesting and easier to draw a conclusion (Junaidi, 2019).

1.1. Theoretical Framework and Related Research

1.1.1. Learning Entrepreneurship in High Schools and Vocational Schools

The digital era competencies, such as the current entrepreneurial competence and entrepreneurial mindset, are important competencies and must be mastered by individuals (Purbaningrum & Soenarto, 2016). Entrepreneurship education is usually a dynamic educational process (Sukardi, 2016; Trihudiyatmanto, 2019). Entrepreneurship education is expected to form individual life skills through the acquisition of learning materials and a series of practical activities in a structured manner in order to form and build entrepreneurial attitudes (Wibowo & Suasana, 2017). This indicates that entrepreneurial competence is a competency that can be learned by anyone (Winardi, 2003). With the implementation of the 2013 Curriculum, entrepreneurship is an alternative to providing entrepreneurial competence (Maresch et al., 2016).

The results of field facts show that information obtained through observations and interviews with craft and entrepreneurship subject teachers still uses simple and less varied learning media, such as printed modules. The lack of a variety of learning media or learning resources used to support learning activities results in students having difficulty in achieving the competencies have been determined in the learning objectives. Based on the implementation of these observations, it was also found that the teacher applied a task-centred learning model. The teacher starts the learning process by delivering material with the help of book media or print modules, without using presentation media/other innovative technology-based learning media; then, at the final stage of the learning process, the teacher gives students assignments that they have to do.

Education at the upper secondary level is poured into craft and entrepreneurship subjects (Purbaningrum & Soenarto, 2016). This subject has the aim of being able to invite students to get to know various kinds of problems and skills so that they are able to have attitudes and abilities in developing entrepreneurial competency skills (Suasana et al., 2020). The not yet optimal process of learning crafts and entrepreneurship hinders the mastery of entrepreneurial competencies in order to form competitive, creative and innovative human resources (Kusmintarti et al., 2017).

1.1.2. Interactive Multimedia in Learning Activities

Computer-based learning is one of the implementations of the use of technology in education. Through computer-based learning it is hoped that it can help teachers achieve learning goals which have implications for increasing student learning outcomes (Stanojevic et al., 2018). The existence of interactive multimedia will be able to help teachers and students during the implementation of learning, thus enabling learning objectives to be achieved optimally (Irawan & Suryo, 2017). Interactive multimedia is composed of film / video components, text, pictures, practice questions and voice or narration that can provide direction to students as multimedia users (Mahdi, 2019). In addition, the use of technology in the form of multimedia can also be created through the development of a virtual laboratory that can be used for the learning process (Saputro et al., 2019). Based on Suparno (2018), the resulting interactive media products consist of learning material, evaluation or practice questions and other types of information packaged in the form of images, text and videos, which can significantly improve students' critical thinking skills in economics.

In line with this research, Bustanil et al. (2019) revealed that learning material or information contained in multimedia programmes has an influence on student academic achievement; besides that, the use of multimedia learning also creates a more meaningful learning condition for students. The research results obtained by Wati (2019) are related to the development of multimedia learning products that have an effect on Indonesian language learning, especially on the subject of negotiation texts. In response to this, teachers are expected to have skills and mastery of concepts regarding the use of interactive learning multimedia (Har et al., 2019).

Several other studies related to the use of interactive multimedia show that interactive multimedia has a significant impact on increasing academic achievement, mastery of concepts and learning materials (Beydogan & Hayran, 2015), improving skills and being able to influence students' affective attitudes (Gan et al., 2015; Irawan & Suryo, 2017; Kao & Luo, 2020). So, when interacting directly with students, teachers are able to create interesting, dynamic and interactive learning conditions through the use of information and communication technology which is currently developing very rapidly.

Therefore, the importance of using multimedia for learning effectiveness is something interesting to explore and develop. Interactive multimedia as an innovative form of learning media was chosen because this media has a high level of interactivity and can attract students' attention during the learning process (Guan et al., 2018; Khan & Masood, 2015; Majid et al., 2012).

1.2. Purpose of the Study

This research is a research and development activity with the aim of being able to create appropriate products as learning media in digital format, namely interactive multimedia in entrepreneurial learning in the hope that it will be able to provide a stimulus to increase students' entrepreneurial attitudes. Several studies that have been carried out previously have shown that interactive multimedia has succeeded in providing various impacts and has also become one of the contributing factors in increasing student competence, such as increasing their cognitive, affective and psychomotor abilities. However, some studies only discuss and mention little about multimedia and entrepreneurship; besides that, the integration of learning media with local potential as an approach that can provide stimulus and innovation to the learning process is also limited.

Through research and development (R&D), the ADDIE model will then adopt and produce interactive multimedia products that are suitable for the learning process; thus, the purpose of this research is specifically divided into several sub-objectives according to the scope of the

implementation of research and development activities, namely knowing the implementation process entrepreneurial learning activities in schools, knowing interactive multimedia assessments by experts and knowing interactive multimedia assessments by media targets, namely teachers and students.

2. Method and Materials

2.1. Research Model

Research and development (R&D) became the design of this research, with the adoption of the ADDIE model. ADDIE is an acronym for analysis, design, development, implementation and evaluation. The ADDIE model selection is based because it has several advantages when developing a product, such as dynamic and flexible (Nichols Hess & Greer, 2016).

Each stage that has described the process has an important part in this research, for the analysis stage (A) is the initial stage that will produce identification and results that actually occur in the field. In addition, the design stage (D) is important to ensure the type of multimedia to be produced and minimise errors. The development stage (D) contains the manufacture and product validation process by media experts and material experts. The implementation (I) and evaluation (E) stages in this study were carried out simultaneously in accordance with the research objective, namely to produce interactive multimedia that is suitable for entrepreneurship learning; this stage is an implementation and follow-up activity through an assessment of the feasibility of multimedia developed by teachers and students as user products.

This research focuses on developing interactive multimedia that is suitable for entrepreneurship learning with materials that contain local potential. This research was conducted to create an innovation in entrepreneurship learning with the hope that the implementation of learning activities can be effective, dynamic and fun for students. Multimedia must go through various feasibility tests by media experts, material experts, students and teachers. So, in this scientific article, the researcher intends to focus on solving the problem on the validity or feasibility test of interactive multimedia products by media experts, material experts, students and teachers.

2.2. Participants

This interactive multimedia will be assessed for its feasibility by experts and practitioners included in the research sample, i.e., from two media experts, two material experts, four learning practitioners or teachers and two classes taken from high schools above, with a total of 54 high school students. Each expert, both media expert and material expert, gave an assessment of interactive multimedia quality in terms of material content, appearance, programmes and ease of use.

2.3. Data Collection Tools and Data Collection Process

The research instrument used was a validation sheet in the form of a questionnaire response from every validator. The research instrument in the form of a material expert and media expert validation sheet was adopted and modified from the research instrument that had been conducted by Ramadhani and Muhtadi (2018). The media expert assessment sheet consisted of two assessment aspects, namely the display aspect consisting of an opening component, a design component, an audio component and a video component. The next aspect is the programme aspect which consisted of an operation component and a navigation component, with a total of 29 questions on this validation sheet.

In addition, the material expert validation sheet consisted of two assessment aspects, namely learning aspects and material or content aspects. The learning aspect consists of components of competence, introduction, learning process and evaluation, while the material aspect consists of components of material quality and language use with a total of 16 questions on the material expert validation sheet.

The questionnaire provided for students and the teachers as a whole contains the aspects contained in the interactive multimedia model product based on local potential, such as appearance, clarity of writing, ease of use, accuracy of using images in examples, updating of material, suitability of material with learning objectives, suitability of material with practice questions and the accuracy of the programme navigation control, with a total of 20 questions.

2.4. Data Analysis

The analysis of the data was used to determine the feasibility of the product using descriptive statistical analysis techniques. This analysis technique aims to process the data into a description of the mean score through the following formula expressed by Bustanil et al. (2019):

$$RS = \frac{F}{N} \times 100$$

Information:

- RS = Percentage of Assessment Results
- f = score for each aspect
- n = maximum score

The results of the assessment related to validation are calculated as an average number and interpreted into the eligibility criteria shown in table 1.

Table 1: Conversion of Validation Score

Score Percentage (%)	Category	Decision
X > 76%	Excellent	Feasible
50% < X ≤ 75%	Good	Decent Enough
25% < X ≤ 50%	Poor	Not Feasible
X ≤ 25%	Very Poor	Very Unworthy

3. Results

3.1. Results of Needs Analysis and Multimedia Design

The results of the analysis and design are presented in this section. At this stage, it will contain two steps to be able to answer the research questions, including the analysis stage and the design stage.

3.1.1.1. Analysis Stage

Based on the preliminary study process as a form of analysis at the ADDIE stage, it was concluded that during the learning process of craftsmanship and entrepreneurship subjects, teachers tend not to utilise digital learning media. This is indicated by observations during the learning process; teachers still use modules provided by the government as a learning support tool. In addition, during the process of observing the learning process, the teacher has not integrated the subject matter with local

potential or excellence as mandated by the curriculum. Through the results of this preliminary study, the researcher then sets a research goal, which is to create learning innovations through the development of digital media in the form of interactive multimedia whose material has been integrated with local potential, in accordance with the direction of the national curriculum.

3.1.1.2. Design Stage

At the design stage, several activities carried out are designing the product being developed. The product specifications related to the design to be made are as follows:

- The product being developed is an interactive multimedia product that can be used as a computer-based electronic learning resource.
- Products developed by one batch of public senior high school, Cirebon district, have included local potential or superiority, with the material design consisting of learning objectives, materials, summaries, bibliography, developer profiles and questions or evaluations.
- In addition to containing text material, the product will also contain several examples of illustrations and videos based on local potential that have been adapted to needs.

At this design stage, there are steps that must be taken, namely 1) designing a storyboard, i.e., the concept or delivery of ideas or initial sketches of interactive multimedia; 2) designing multimedia displays; 3) writing material on interactive multimedia developer applications and arranging material according to text size, text colour, layout and size of images and videos; and 4) publishing interactive multimedia products in the form of .exe.

3.2. Interactive Multimedia Product Development Process

Adopting the ADDIE development model, this section contains three stages, namely the development stage, implementation stage and evaluation stage. The results of each step are explained in the following subsections.

3.2.1. Development Stage

The feasibility of developing interactive multimedia products was tested both theoretically and practically. The media experts were two people, who were media expert validators I and II. Table 2 shows the results of the assessment of the aspects assessed by the validator.

Table 2: Validation Results of Media Experts

Validator	Aspect (%)		Average Score (%)	Decision
	Display	Program		
Media Validator I	91,1%	100%	95,5%	Feasible
Media Validator II	93,3%	81,8%	87,5%	Feasible

Based on Table 2, the information is obtained that the interactive multimedia product developed has a quality that is classified as 'very good'. The results of the assessment on the next aspect obtained an average score of 91.1% and 93.3%, respectively. Positive results were also followed in the next aspect which had 'very good' quality; this was indicated by the average score of 100% and 81.8%, respectively. Therefore, the overall assessment of media validator I obtained an average score of

95.5%, which had a ‘decent’ interpretation, and the assessment of media validator II obtained an average score of 87.5%, which was included in the ‘feasible’ category.

Meanwhile, the results of the theoretical validation carried out by material experts I and II are presented in Table 3.

Table 3: Validation Results according to Material Expert

Validator	Aspect (%)		Average Score (%)	Decision
	Instruction	Content		
Material Validator I	97,1%	91,1%	94,1%	Feasible
Material Validator II	97,1%	95,6%	96,3%	Feasible

Based on table 3, the information is obtained that the interactive multimedia product developed has a quality that is included in the ‘excellent’ qualification. This is indicated by the results of the assessment which got a score of 97.1% by each validator. Followed by other aspects, the quality is also very good, because the validation results obtained by each validator are 91.1% and 95.6%, respectively. Therefore, the assessment of the material validator I had a mean total score of 94.1% and the assessment of the material validator II obtained an average score of 96.3%; this shows that each validator's assessment is included in the ‘feasible’ category.

3.2.2. Implementation and Evaluation Stage

The stages of implementation and evaluation consist of validation by media experts and material experts and validation by teachers who are also followed by high school students and users of the products. The results of the assessment were carried out by four teachers as practitioners, namely high school entrepreneurship subject teachers. Table 4 shows an illustration of the validation results.

Table 4: Results of Validation by Practitioners

Aspect	Teachers (% per aspect)			
	I	II	III	IV
Display	83,3	93,3	96,7	76,7
Program	73,3	86,7	86,7	73,3
Instruction	80	88	80	80
Content	80	96,7	86,7	80
Average (%)	79,2	91,2	87,5	77,5
Category	Excellent	Excellent	Excellent	Excellent
Decision	Feasible	Feasible	Feasible	Feasible

Each aspect obtained an average score that can be categorised as ‘good’; this acquisition shows that the teacher has the view that the developed multimedia is feasible to be tested on students with several inputs, and some of the inputs obtained by practitioners are 1) given narration in several parts of the display and 2) practice questions need to be adjusted to basic competencies.

The next step is for students to evaluate the product. This trial was conducted by 54 high school students. The average score for each aspect is shown in Figure 1.

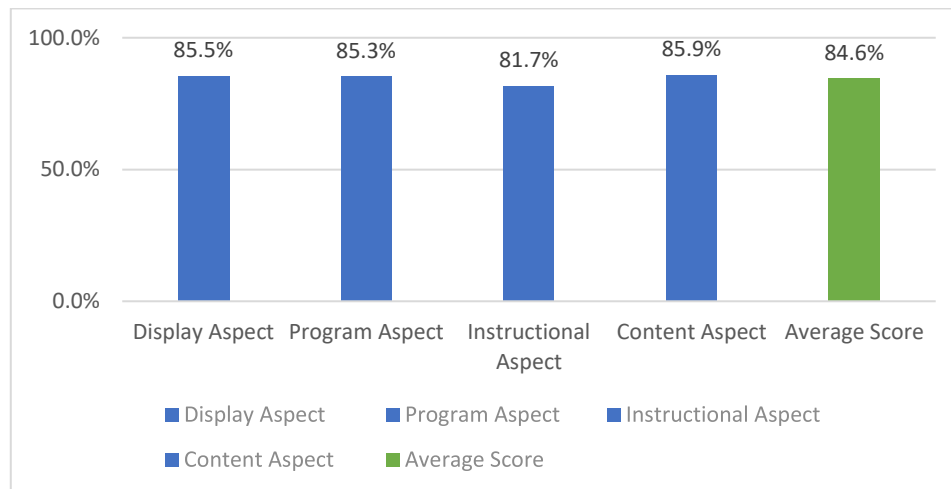


Figure 1: The results of student product trials

Based on Figure 1, the total number of assessments is obtained, which is then analysed using the average percentage value. The following is a description of the average number of scores for each aspect: 1) the display aspect: in the display aspect, the average percentage is 85.5 % which is included in the ‘very good’ category; 2) programme aspect: in the programme aspect, the average number is 85.3%, which is included in the ‘very good’ category; 3) the learning aspect got a score of 81.7%, which was included in the ‘good’ category; and 4) the material aspect got a score of 85.9%, which was included in the ‘very good’ category.

Overall, the results of student assessments regarding the feasibility of interactive multimedia model products are 84.7%, which are included in the very good category. Through the quality of the results of various aspects of the assessment that have been carried out, it can be concluded that interactive multimedia is declared ‘worthy’ to be used as a media in the learning process of entrepreneurship.

4. Discussion

This research has resulted in the decision by media experts and material experts who provide a decision based on their assessment of interactive multimedia where interactive multimedia is declared ‘feasible’; this is because multimedia has fulfilled several criteria or indicators, according to Ramadhani and Muhtadi (2018), and so it has an average score – high average, in line with the decisions of media experts, material experts and the teacher. The results of the assessment obtained an average total score of 4.25, stating that the interactive multimedia that was developed was categorised as ‘good’ and so it was ‘feasible’ to be applied to users.

The results of the assessment by each validator and practitioner cannot be separated from the product design and constituent components of interactive multimedia products that have been developed by taking into account the characteristics of students, display design, background music composition, animation, learning videos and question exercises (Abdillah et al., 2018); so it is hoped that students will be motivated to learn (Irawan & Suryo, 2017; Park et al., 2014) and it can affect student academic achievement (Hoerunnisa et al., 2019; Hwang et al., 2014; Kurniawati & Nita, 2018; Suyitno, 2016) through the achievement of competencies as defined in learning, especially in the handcraft and entrepreneurship learning process.

The advantage of this multimedia is in the material that has been integrated with the values contained in the local potential that exists in an area; this is because it is important to include local potential as part of the development of materials on entrepreneurship learning (Sukardi, 2016), and the government's appeal as outlined in the implementation of a nationally applicable curriculum that teachers must be able to develop learning curricula that aim to optimally explore the potential of certain areas. Moreover, if the learning experiences created in learning activities at school have relevance to students' lives, it will be easier for students to understand the learning material (Waridah & Aman, 2015). Therefore, one of the effective ways to achieve learning objectives is to make local potential or advantages as an integrated part of the material in a subject at school (Sari et al., 2017; Situmorang, 2016) and improving students' abilities through the adoption of information and communication technology (ICT) in the learning process, in line with the times, because ICT has become an important part of learning nowadays (Wijaya et al., 2016). However, a teacher must always be able to pay attention to the level of validity of learning resources or media that will be used for the learning process, so that the quality of information in learning activities can be maintained (Anggraini & Eddy Sartono, 2019; Sari et al., 2020; Sofyan et al., 2019). This is because the ability of teachers to integrate ICT will be in line with the improvement of teachers' abilities in technological literacy (Nuangchalerm et al., 2020).

Several studies are related to the use of ICT in educational institutions; it is known that the key to the success of using ICT is a positive and supportive user attitude towards the existence of the technology used (Gokhale et al., 2013; Widayastono, 2017). Interactive multimedia as a form of integration between learning media and the use of ICT will be very easy to implement into the learning process (Yue, 2017). This is because of the importance of ICT as part of learning in the 21st century and some of the advantages of multimedia, including interactive, in the sense that there is freedom for students to choose material to study (Muslem & Abbas, 2017; Sholihah et al., 2020), although interactive multimedia has many benefits in increasing students' motivation, interest and academic achievement. However, interactive multimedia products cannot replace the teacher's role in the learning process (Sefriani et al., 2020).

A learning media must be able to attract the attention of students, facilitate students in learning and can provide a pleasant learning experience. Interactive multimedia developed for craft and entrepreneurship subjects has been designed and then developed to facilitate learning. In addition, this interactive multimedia can be used as a reference for other subjects to develop learning media. On the other hand, the development of interactive multimedia-based learning tools has limitations, including limitations to certain subjects and topics; the integration of materials with local potential is limited to the use of examples; the use of multimedia programmes still requires a computer; and in this research, it is only limited to developing and testing product feasibility, not to measure product effectiveness with certain measurement variables. Through this research and development, other researchers can follow-up to determine the effect of interactive multimedia on students' mastery of entrepreneurial competencies. With decent results and appropriate needs analysis, other researchers are also expected to develop interactive multimedia learning entrepreneurship for other topics. In addition, teachers are expected to be able to be consistent, even work harder to increase the scale of the use of media in the learning process.

5. Conclusion and Recommendations

The result of this research is an interactive multimedia product suitable for learning in high schools, especially in the subjects of craftsmanship and entrepreneurship. This multimedia development is

based on the results of the needs analysis which shows that during the learning process, the teacher has not been able to optimise the learning media, which indicates that the teacher only uses print modules which tend to be static and not interactive. On the other hand, technological development demands innovation in various fields. Therefore, students have a very supportive view of developing interactive multimedia. The results of the development stage showed that the assessments made by the two media experts are in the qualifications of 'proper'. The validation by two material experts shows the same thing, i.e., they are included in the qualification of 'proper'. Practitioner validation by four subject teachers obtained results which showed that the developed interactive multimedia was included in the 'feasible' category, as well as validation by 54 students whose results indicated that they were qualified as 'feasible'. Therefore, the development of interactive multimedia as an innovation in learning media in the digital era is declared 'feasible' to be used in the learning activities in senior high schools. Based on the results described, interactive multimedia products developed for entrepreneurship subjects are included in the 'feasible' category, and therefore, researchers suggest that interactive multimedia can be used as an alternative media choice to be implemented in the classroom activities.

References

- Abdillah, M. N., & Sakapurnama, E. (2017). Link and match learning outcomes of entrepreneurial competencies required in Indonesian companies. *Turkish Online Journal of Educational Technology, Special Issue*, 466–472.
- Abdillah, R., Sunardi, S., & Ardianto, D. T. (2018). Pengembangan Aplikasi Multimedia Pembelajaran CD Tutorial Pada Mata Kuliah Berbasis Praktik. *Teknodika*, 16(1), 53–61. <https://doi.org/10.20961/teknodika.v16i1.34755>
- Abidin, Z. (2016). Penerapan Pemilihan Media Pembelajaran. *Edcomtech*, 1(1), 9–20. Retrieved from <http://journal2.um.ac.id/index.php/edcomtech/article/view/1784>
- Aidarbekova, K. A., Abildina, S. K., Odintsova, S. A., Mukhametzhanova, A. O., & Toibazarova, N. A. (2021). Preparing future teachers to use digital educational resources in primary school. *World Journal on Educational Technology: Current Issues*, 13(2), 188–200. <https://doi.org/10.18844/wjet.v13i2.5653>
- Anggraini, M. S. A., & Eddy Sartono, E. K. (2019). Kelayakan Pengembangan Multimedia Interaktif Ramah Anak untuk Meningkatkan Kemampuan Pemahaman Konsep DAN Karakter Cinta Tanah Air Siswa Kelas IV SD. *Kwangsan: Jurnal Teknologi Pendidikan*, 7(1), 57–77. <https://doi.org/10.31800/jtp.kw.v7n1.p57--77>
- Bayne, S. (2015). What's the matter with 'technology-enhanced learning'? *Learning, Media and Technology*, 40(1), 5–20. <https://doi.org/10.1080/17439884.2014.915851>
- Beydoğan, H. Ö., & Hayran, Z. (2015). The Effect of Multimedia-Based Learning on the Concept Learning Levels and Attitudes of Students. *Eurasian Journal of Educational Research*, 15(60), 261–280. <https://doi.org/10.14689/ejer.2015.60.14>
- Boyles, T. (2012). 21 st century knowledge, skills, and abilities and entrepreneurial competencies: A model for undergraduate entrepreneurship education. *Journal of Entrepreneurship Education*, 15, 41–64.
- Bustanil S, M., Asrowi, & Adianto, D. T. (2019). Pengembangan Media Pembelajaran Interaktif Berbasis Video Tutorial Di Sekolah Menengah Kejuruan. *JTP - Jurnal Teknologi Pendidikan*, 21(2), 119–134. <https://doi.org/10.21009/jtp.v21i2.11568>

- Roemintoyo, R., Miyono, N., Murniati, N. A. N., & Budiarto, M. K., (2022). Optimising the utilisation of computer-based technology through interactive multimedia for entrepreneurship learning. *Cypriot Journal of Educational Science*, 17(1), 105-119. <https://doi.org/10.18844/cjes.v17i1.6686>
- Christian Pilarta Oliquino, J. (2019). 21st Century Skills of Students in a Technical Vocational Education and Training Institution in the Philippines. *Jurnal Pendidikan Progresif*, 9(2), 146–155. <https://doi.org/10.23960/jpp.v9.i2.201903>
- Dzulfikri, A., & Kusworo, B. (2019). Sikap, Motivasi, dan Minat Berwirausaha Mahasiswa di Surabaya. *JKMP (Jurnal Kebijakan Dan Manajemen Publik)*, 5(2), 183. <https://doi.org/10.21070/jkmp.v5i2.1310>
- Gan, B., Menkhoff, T., & Smith, R. (2015). Enhancing students' learning process through interactive digital media: New opportunities for collaborative learning. *Computers in Human Behavior*, 51, 652–663. <https://doi.org/10.1016/j.chb.2014.12.048>
- Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science*. <https://doi.org/10.21890/ijres.23596>
- Gokhale, A. A., Brauchle, P. E., & Machina, K. F. (2013). Scale to Measure Attitudes Toward Information Technology. *International Journal of Information and Communication Technology Education*, 9(3), 13–26. <https://doi.org/10.4018/jicte.2013070102>
- Guan, N., Song, J., & Li, D. (2018). On the Advantages of Computer Multimedia-aided English Teaching. *Procedia Computer Science*, 131, 727–732. <https://doi.org/10.1016/j.procs.2018.04.317>
- Har, E., Khairi, A., & Roza, W. (2019). Teachers' skills and ICT facilities for science learning at senior high school in Padang city. *Australian Educational Computing*, 34(1). Retrieved from <http://journal.acce.edu.au/index.php/AEC/article/view/177>
- Hoerunnisa, A., Suryani, N., & Efendi, A. (2019). The effectiveness of the use of e-learning in multimedia classes to improve vocational students' learning achievement and motivation. *Kwangsan: Jurnal Teknologi Pendidikan*, 7(2), 123. <https://doi.org/10.31800/jtp.kw.v7n2.p123--137>
- Hwang, G.-J., Hung, C.-M., & Chen, N.-S. (2014). Improving learning achievements, motivations and problem-solving skills through a peer assessment-based game development approach. *Educational Technology Research and Development*, 62(2), 129–145. <https://doi.org/10.1007/s11423-013-9320-7>
- Indah Septiani, A. nisa N. S., Septiani, I., Rejekiningsih, T., Triyanto, & Rusnaini. (2020). Development of interactive multimedia learning courseware to strengthen students' character. *European Journal of Educational Research*, 9(3), 1267–1279. <https://doi.org/10.12973/eu-jer.9.3.1267>
- Irawan, E., & Suryo, T. (2017). Implikasi Multimedia Interaktif Berbasis Flash Terhadap Motivasi dan Prestasi Belajar Matematika. *Beta Jurnal Tadris Matematika*, 10(1), 33–50. <https://doi.org/10.20414/betajtm.v10i1.17>
- Ishaq, K., Azan, N., Zin, M., Rosdi, F., Abid, A., & Ijaz, M. (2020). The Impact of ICT on Students' Academic Performance in Public Private Sector Universities of Pakistan. *International Journal of Innovative Technology and Exploring Engineering*, 9(3), 1117–1121. <https://doi.org/10.35940/ijitee.c8093.019320>
- Junaidi, J. (2019). Peran Media Pembelajaran Dalam Proses Belajar Mengajar. *Diklat Review : Jurnal Manajemen Pendidikan Dan Pelatihan*, 3(1), 45–56. <https://doi.org/10.35446/diklatreview.v3i1.349>
- Kali, Y., McKenney, S., & Sagy, O. (2015). Teachers as designers of technology enhanced learning. *Instructional Science*, 43(2), 173–179. <https://doi.org/10.1007/s11251-014-9343-4>
- Kao, C.-C., & Luo, Y.-J. (2020). Effects of Multimedia-Assisted Learning on Learning Behaviors and Student Knowledge in Physical Education Lessons: Using Basketball Game Recording as an Example. *International Journal of Emerging Technologies in Learning (IJET)*, 15(01), 119–139. <https://doi.org/10.3991/ijet.v15i01.11393>

- Roemintoyo, R., Miyono, N., Murniati, N. A. N., & Budiarto, M. K., (2022). Optimising the utilisation of computer-based technology through interactive multimedia for entrepreneurship learning. *Cypriot Journal of Educational Science*, 17(1), 105-119. <https://doi.org/10.18844/cjes.v17i1.6686>
- Kapi Kahbi, A. Y., Osman, N., Ramli, R. Z., & Taib, J. M. (2017). Multimedia education tools for effective teaching and learning. *Journal of Telecommunication, Electronic and Computer Engineering*, 9(2–8), 143–146.
- Khan, F. M. A., & Masood, M. (2015). The Effectiveness of an Interactive Multimedia Courseware with Cooperative Mastery Approach in Enhancing Higher Order Thinking Skills in Learning Cellular Respiration. *Procedia - Social and Behavioral Sciences*, 176, 977–984. <https://doi.org/10.1016/j.sbspro.2015.01.567>
- Kurniawati, I. D., & Nita, S.-. (2018). MEDIA PEMBELAJARAN BERBASIS MULTIMEDIA INTERAKTIF UNTUK MENINGKATKAN PEMAHAMAN KONSEP MAHASISWA. *DOUBLECLICK: Journal of Computer and Information Technology*, 1(2), 68–75. <https://doi.org/10.25273/doubleclick.v1i2.1540>
- Kusmintarti, A., Riwijanti, N. I., & Asdani, A. (2017). Pendidikan Kewirausahaan dan Intensi Kewirausahaan dengan Sikap Kewirausahaan sebagai Mediasi. *Journal of Research and Applications: Accounting and Management*, 2(2), 119. <https://doi.org/10.18382/jraam.v2i2.160>
- Lounsbury, M., Cornelissen, J., Granqvist, N., & Grodal, S. (2019). Culture, innovation and entrepreneurship. *Innovation*, 21(1), 1–12. <https://doi.org/10.1080/14479338.2018.1537716>
- Mahdi, H. S. (2019). Using Multimedia-Assisted LINC'S for Learning English Pronunciation. *International Journal of Emerging Technologies in Learning (IJET)*, 14(09), 105–117. <https://doi.org/10.3991/ijet.v14i09.10356>
- Majid, M. S. Z. B. A., Ali, M. M. B. A., Rahim, A. A. B. A., & Khamis, N. Y. B. (2012). The Development of Technical English Multimedia Interactive Module to Enhance Student Centered Learning (SCL). *Procedia - Social and Behavioral Sciences*, 67, 345–348. <https://doi.org/10.1016/j.sbspro.2012.11.337>
- Maresch, D., Harms, R., Kailer, N., & Wimmer-Wurm, B. (2016). The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs. *Technological Forecasting and Social Change*, 104, 172–179. <https://doi.org/10.1016/j.techfore.2015.11.006>
- Marta, L. C. (2019). The Integration of digital devices into learning spaces according to the needs of primary and secondary teachers. *TEM Journal*, 8(4), 1351–1358. <https://doi.org/10.18421/TEM84-36>
- Muslem, A., & Abbas, M. (2017). The Effectiveness of Immersive Multimedia Learning with Peer Support on English Speaking and Reading Aloud. *International Journal of Instruction*, 10(01), 203–218. <https://doi.org/10.12973/iji.2017.10113a>
- Nichols Hess, A., & Greer, K. (2016). Designing for Engagement: Using the ADDIE Model to Integrate High-Impact Practices into an Online Information Literacy Course. *Comminfolit*, 10(2), 264. <https://doi.org/10.15760/comminfolit.2016.10.2.27>
- Nuangchalerm, P., Prachagool, V., Islami, R. A. Z. El, & Abdurrahman, A. (2020). Contribution of Integrated Learning through STEM Education in ASEAN Countries. *Jurnal Pendidikan Progresif*, 10(1), 11–21. <https://doi.org/10.23960/jpp.v10.i1.202002>
- Nusir, S., Alsmadi, I., Al-Kabi, M., & Sharadgah, F. (2013). Studying the impact of using multimedia interactive programs on children's ability to learn basic math skills. *E-Learning and Digital Media*, 10(3), 305–319. <https://doi.org/10.2304/elea.2013.10.3.305>
- Park, B., Plass, J. L., & Brünken, R. (2014). Cognitive and affective processes in multimedia learning. *Learning and Instruction*, 29, 125–127. <https://doi.org/10.1016/j.learninstruc.2013.05.005>
- Purbaningrum, C. W. D., & Soenarto, S. (2016). Pengembangan Model Pembelajaran Parakarya dan Kewirausahaan dengan Prinsip the Great Young Entrepreneur di SMK untuk Kurikulum 2013. *Jurnal Pendidikan Vokasi*, 6(1), 15. <https://doi.org/10.21831/jpv.v6i1.8112>

- Roemintoyo, R., Miyono, N., Murniati, N. A. N., & Budiarto, M. K., (2022). Optimising the utilisation of computer-based technology through interactive multimedia for entrepreneurship learning. *Cypriot Journal of Educational Science*, 17(1), 105-119. <https://doi.org/10.18844/cjes.v17i1.6686>
- Ramadhani, R., & Muhtadi, A. (2018). Development of Interactive Multimedia in Learning Islamic Education. *International Journal of Multicultural and Multireligious Understanding*, 5(6), 9–15. <https://doi.org/10.18415/ijmmu.v5i6.488>
- Rusdin, N. M. (2018). Teachers' Readiness in Implementing 21st Century Learning. *International Journal of Academic Research in Business and Social Sciences*, 8(4), 1271–1284. <https://doi.org/10.6007/IJARBS/v8-i4/4270>
- SAPUTRO, A. D., ROHAETI, E., & PRODJOSANTOSO, nti K. (2019). Using Inquiry-Based Laboratory Instruction to Improve Critical Thinking and Scientific Process Skills among Preservice Elementary Teachers. *Eurasian Journal of Educational Research*, 19(80), 1–20. <https://doi.org/10.14689/ejer.2019.80.8>
- Saputro, E. P., Achmad, N., & Handayani, S. (2016). Identifikasi Faktor yang Mempengaruhi Sukses Wirausaha. *Benefit: Jurnal Manajemen Dan Bisnis*, 1(1), 10–20. <https://doi.org/10.23917/benefit.v1i1.2361>
- Sari, D. I., Rejekiningsih, T., & Muchtarom, M. (2020). Students' Digital Ethics Profile in the Era of Disruption: An Overview from the Internet Use at Risk in Surakarta City, Indonesia. *International Journal of Interactive Mobile Technologies (IJIM)*, 14(03), 82. <https://doi.org/10.3991/ijim.v14i03.12207>
- Sari, R. U., Rusdarti, R., & Syamwil, R. (2017). Pengembangan Model Pembelajaran Kewirausahaan Berbasis Potensi Lokal di Sekolah Kejuruan Wilayah Kalimantan Barat. *Journal of Vocational and Career Education*, 2(2), 87–95. <https://doi.org/10.15294/jvce.v2i2.13858>
- Sefriani, R., Wijaya, I., Menrisal, M., & Dewi, M. (2020). Testing Of The Validity of Interactive Learning Module on Creative and Entrepreneurs Learning Products. *Journal of Educational Science and Technology (EST)*, 6(1), 73–78. <https://doi.org/10.26858/est.v6i1.10277>
- Shatri, Z. G. (2020). Advantages and disadvantages of using information technology in learning process of students. *Journal of Turkish Science Education*, 17(3), 420–428. <https://doi.org/10.36681/tused.2020.36>
- Situmorang, R. (2016). Analisis Potensi Lokal untuk Mengembangkan Bahan Ajar Biologi di SMA Negeri 2 Wonosari. *Jurnal Pendidikan Sains Universitas Muhammadiyah Semarang*, 4(1), 51–57. <https://doi.org/10.26714/jps.4.1.2016.51-57>
- Sofyan, H., Anggereini, E., & Saadiah, J. (2019). Development of E-Modules Based on Local Wisdom in Central Learning Model at Kindergartens in Jambi City. *European Journal of Educational Research*, 8(4), 1137–1143. <https://doi.org/10.12973/eu-jer.8.4.1139>
- Stanojević, D., Cenić, D., & Cenić, S. (2018). Application of computers in modernization of teaching science. *International Journal of Cognitive Research in Science, Engineering and Education*, 6(2), 89–104. <https://doi.org/10.5937/ijcrsee1802089S>
- Suasana, G. K. I. G. A., Ekawati, N. W., Sudiana, I. K., & Wardana, I. G. (2020). Dampak Pendidikan Kewirausahaan pada Entrepreneur Behavior Index (EBI) dan Intensi Berwirausaha. *MATRIK: JURNAL MANAJEMEN, STRATEGI BISNIS DAN KEWIRAUSAHAAN*, 14(1), 31–42. <https://doi.org/10.24843/MATRIK:JMBK.2020.v14.i01.p04>
- Sugiyati. (2016). *Pengaruh Media Pembelajaran Dan Minat Belajar Terhadap Hasil Belajar Matematika*. 1(3), 227–241. <https://doi.org/10.22236/JPPP>
- Sukardi, S. (2016). Desain Model Prakarya Dan Kewirausahaan Berbasis Ekonomi Kreatif Berdimensi Industri Keunggulan Lokal. *Jurnal Cakrawala Pendidikan*, 1(1), 114–124. <https://doi.org/10.21831/cp.v1i1.8381>
- Sung, Y.-T., Chang, K.-E., & Liu, T.-C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, 94, 252–275. <https://doi.org/10.1016/j.compedu.2015.11.008>

- Roemintoyo, R., Miyono, N., Murniati, N. A. N., & Budiarto, M. K., (2022). Optimising the utilisation of computer-based technology through interactive multimedia for entrepreneurship learning. *Cypriot Journal of Educational Science*, 17(1), 105-119. <https://doi.org/10.18844/cjes.v17i1.6686>
- Suparno, S. (2018). Development of E-Book Multimedia Model to Increase Critical Thinking of Senior High School Students. *Dinamika Pendidikan*, 12(2), 196–206. <https://doi.org/10.15294/dp.v12i2.13567>
- Suyitno, S. (2016). Pengembangan Multimedia Interaktif Pengukuran Teknik untuk Meningkatkan Hasil Belajar Siswa SMK. *Jurnal Pendidikan Teknologi Dan Kejuruan*, 23(1), 101–109. <https://doi.org/10.21831/jptk.v23i1.9359>
- Tafonao, T. (2018). Peranan Media Pembelajaran Dalam Meningkatkan Minat Belajar Mahasiswa. *Jurnal Komunikasi Pendidikan*, 2(2), 103. <https://doi.org/10.32585/jkp.v2i2.113>
- Trihudyatmanto, M. (2019). Pengembangan Kompetensi Kewirausahaan Untuk Meningkatkan Keunggulan Bersaing UMKM (Studi Empirik Pada UMKM Pande Besi di Wonosobo). *Journal of Economic, Management, Accounting and Technology*, 2(1), 22–32. <https://doi.org/10.32500/jematech.v2i1.397>
- Tukenova, N. I., Mursakimova, G. A., Gruzdeva, M. L., Chetiyeva, K. Z., Elepbergenova, A. U., & Iskakova, A. A. (2019). Educational Multimedia-Resources in Education. *International Journal of Innovative Technology and Exploring Engineering*, 8(10), 3617–3620. <https://doi.org/10.35940/ijitee.I9788.0881019>
- Valtonen, T., Sointu, E., Kukkonen, J., Mäkitalo, K., Hoang, N., Häkkinen, P., Järvelä, S., Näykki, P., Virtanen, A., Pöntinen, S., Kostiaainen, E., & Tondeur, J. (2019). Examining pre-service teachers' Technological Pedagogical Content Knowledge as evolving knowledge domains: A longitudinal approach. *Journal of Computer Assisted Learning*, 35(4), 491–502. <https://doi.org/10.1111/jcal.12353>
- Waridah, W., & Aman, A. (2015). PENGEMBANGAN PERANGKAT PEMBELAJARAN TEMATIK-INTEGRATIF TEMA MENGHARGAI JASA PAHLAWAN BERBASIS SOSIOKULTURAL DI SEKOLAH DASAR. *Jurnal Prima Edukasia*, 3(2), 213. <https://doi.org/10.21831/jpe.v3i2.6465>
- Wati, N. R. (2019). Developing Macromedia Flash Teaching Material in the Topic of Negotiating Text for Muhammadiyah Vocational School in Magelang. *Journal of Vocational Education Studies*, 2(1), 55–60. <https://doi.org/10.12928/joves.v2i1.832>
- Widyastono, H. (2017). Pemanfaatan Teknologi Informasi dan Komunikasi pada Sekolah Menengah pertama Negeri Akreditasi A di Provinsi Jawa Timur. *Jurnal Kwangsan*, 5(1), 21–38. <https://doi.org/10.31800/jurnalkwangsan.v5i1.37>
- Wijaya, E. Y., Sudjimat, D. A., & Nyoto, A. (2016). Transformasi Pendidikan Abad 21 Sebagai Tuntutan. *Jurnal Pendidikan*, 1, 263–278. Retrieved from: <https://repository.unikama.ac.id/840/32/263-278%20TRANSFORMASI%20PENDIDIKAN%20ABAD%2021%20SEBAGAI%20TUNTUTAN%20PENGEMBANGAN%20SUMBER%20DAYA%20MANUSIA%20DI%20ERA%20GLOBAL.pdf>
- Winardi, J. (2003). *Entrepreneur dan Entrepreneurship*. Prenada Media.
- Witte, K. D., Haelermans, C., & Rogge, N. (2015). The effectiveness of a computer-assisted math learning program. *Journal of Computer Assisted Learning*, 31(4), 314–329. <https://doi.org/10.1111/jcal.12090>
- Yue, N. (2017). Computer multimedia assisted English vocabulary teaching courseware. *International Journal of Emerging Technologies in Learning*, 12(12), 67–78. <https://doi.org/10.3991/ijet.v12.i12.7955>
- Zubaidah, S. (2018). Mengenal 4C: Learning and Innovation Skills untuk Menghadapi Era Revolusi Industri 4.0. *2nd Science Education National Conference, April*, 1–18.