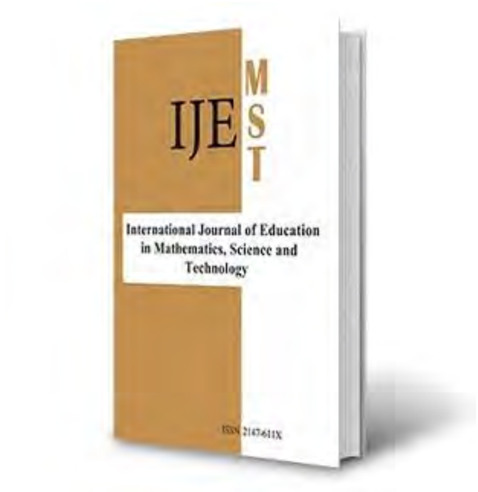

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Developing a Handbook on Multimedia Integration in Mathematics Teaching for Indonesian Primary School Students

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Developing a Handbook on Multimedia Integration in Mathematics Teaching for Indonesian Primary School Students

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Abstract

This study has developed a digital mathematics handbook that helps students to strengthen their mathematical skills at the elementary level of education. A survey of mathematics teachers collected data. In developing an integration manual on technology based on a survey of the state of technological integration in schools, it employed a research and development (R&D) approach. A number of 24 teachers participated in the material creation. The multimedia materials produced during the trial were developed and used. Participants consisted of primary learning children. Results have shown that the trainers' preferred theory is undergraduate, and most of them have a poor capacity to integrate creativity into a research analysis. In the presentation of the under-graduates in mathematics the material produced was extremely good.

Introduction

This paper explores how mathematic handbook is developed for the use of elementary students. The inclusion of the textbook content is basically made of the emergence of Science, Technology, Engineering and Math (henceforth, STEM). As of now, STEM has spread worldwide to demand the efficiency. Several governments and private organizations have upgraded STEM education and encouraged training to develop math and science skills among students and teachers (Levine et al., 2019). Training and education services usually concentrate on increasing the awareness of mathematics and science among individuals (Milovanović & Branovački, 2020; Monkeviciene et al., 2020; Sorvo et al., 2019).

Institutions like the National Science Foundation (NSF) make calls for reforms to attain 21st Century crafts, like interaction, cooperation, advanced thought, media as well as technology literacy using STEM curricula in a transdisciplinary context (National Research Council, 2007). Therefore, it is good reason to apply transdisciplinary approaches in reform initiatives. These approaches offer lessons that connect the separate disciplines. The emergence of transdisciplinary approach to STEM education was verified in 2019. Integrating careers and meaning across integrated curriculum will revolutionize the education process (Wu, Cheng & Koszalka, 2021). Though STEM education has become a popular topic todays, school students rarely reflect the actual use of STEM. Students are more concerned with recall than the generation that came before.

Transdisciplinary methods aim to melt distinctions between traditional disciplines and to then coordinate and plan teaching about right now concrete real-world theme (Exter, Gray & Fernandez, 2019). Teachers come from different disciplines and cross over to plan, teach, and work together to help their students accomplish common transdisciplinary educational goals. Although transdisciplinary teaching is a growing phenomenon in education, little is known about how educators practice transdisciplinary teaching on a day-to-day basis (Bursal & Polat, 2020). There is not much evidence supporting the use of transdisciplinary approaches in K-12 STEM education. The research goal is to create case investigation of a STEM team's day-to-day teaching in an authentic educational environment built around authentic case-based teaching (Wu, Cheng & Koszalka, 2021).

The study of the textbook on mathematics suggested that a student's engagement with mathematics is unsatisfactory; as a result of inadequate textbooks students are either uncomfortable or mathematician (Ding et al., 2015; Ni et al., 2018; Zualkernan, 2016). The other problem that makes mathematics difficult for the students is the absence of science educators in information and communication (ICT) technology (Alshahari, 2016; Brigas, et al., 2016; Domingo & Garganté, 2016; Jagušt et al., 2018; Yuan & Lee, 2012). Innovation in ITC training where STEM is the cornerstone was the center of mathematical training, but the required manual is limited (Chauhan, 2016; Outhwaite et al., 2017; Tarman, 2016). Teachers may use technology to enhance their education or to provide their students with a strong learning environment (Baez Zarabanda, 2019; Ebersole & Kanahele-Mossman, 2020; Foley et al., 2017; Montenegro Rueda, & Fernández Cerero, 2019). Students are involved in programs that enable them to participate in participation in a technologically improved classroom. The committed students have their own teaching duty and the facilitators play their part. While this technique has long been a cause of discussion among educators in advanced countries, it is only beginning to stimulate the educational community (Baytak et al., 2011; Kopish & Marques, 2020; Ohlin, 2019; Ramirez et al., 2016; Rapoport, 2020; Reinhold et al., 2020; Solas & Sutton, 2018;).

Previous researches have highlighted the advantages of ICT in learning (Tadeu et. al, 2019). Reinhold et al. (2020) stress that the use of STEM educational innovation is especially important for teaching numerical topics in learning mathematics. Technology plays a prominent role in mathematics for primary education, identifying mathematical lessons to be applied using the techniques (Domingo and Garganté, 2016). In preschool STEM learning, Aladé et al. (2016) established the efficacy of tactile screen technology. The deliberate written audit of the use of flexible training in critical education undertaken by Baker and Crompton (2000) illustrated the true benefits of innovation reconciliation through the various information divisions. McCulloch et al. (2018) concluded from observing 2670 K-12 students that the introduction of technology in the mathematics course by mathematics teachers is effective.

When we look at things like these, some schools in Indonesia do have some of these technologies in place to teach computer literacy skills, such as a little bit of computer activity and some word processing computer apps. Technological inclusion is a foreign concept to most teachers who lack the necessary technological skills to incorporate computers into their curriculum (Baytak et al., 2011; Bursal & Polat, 2020; Solikhah & Budiharso, 2019; Haryanto, 2020). In Sukoharjo, most of the teachers are competent with computers, and an adapted computer lab was constructed through the efforts of the local teachers. School directors can argue that this new computer system is an efficient way because they've dealt with computers in the past. Will they remain committed? Can we develop learning abilities? With the growth of creativity, educators' responsibilities have further changed. Educator work has been accepted as the key component in a successful combination by numerous creators (Agyei & Kafyulilo, 2019; Akugizibwe & Ahn, 2020; Aslan & Zhu, 2017; Backfish et al., 2020; Dinh, 2019; Mailizar & Fan, 2020; McCulloch et al., 2018; Maria Trigueros & Sacristan, 2008; 2019; Symons & Pierce, 2019). The exams showed that the competence and the willingness of the teacher dictated whether creativity coordination was appropriate for the educational programme (Harland, 2011; Kalimullina et al. 2021; Wu, Cheng & Koszalka, 2021; Solikhah & Budiharso, 2020). The ability of teachers to adapt to change and change their way of understanding helps them embrace their new positions as teachers with the development of technology as a new teaching tool.

Awareness has come to be an important computer skill. Although computer technology is instrumental in enhancing efficiency, it is not necessary to know how to use computers and all the applications on the market (Bursal & Polat, 2020). Schools need to review their curricula and incorporate a technology management and education program that will prepare students for the changing demands of the 21st century (Budiharso & Tarman, 2020; Lee & Lee, 2020; Subedi & Subedi, 2020; Salinas-Vasquez, ete al., 2020; Tarman et al., 2019).

Research Questions

This research aimed to develop a manual to organize PC innovation instructors in the hall of study. The analysis answered in particular to the following questions:

1) How is STEM-based handbook perceived by elementary mathematic teachers in Sukoharjo in teaching learning process of math lesson?
2) How is the validation of the content of the handbook of mathematic lesson for the elementary school students in Sukoharjo?
2) How much does the STEM-based handbook on mathematic being developed give significant effect compared to available mathematic handbook at elementary schools in Sukoharjo?

Theoretical Framework

In general a handbook is defined as a book that provides information on a particular topic or the instruction manual that instructs on how to operate a machine. A handbook is a reference guide, a manual, or a collection of instructions that's intended to inform and steer a person in a given topic area. ... An E-book may be in one of several different subject categories, and generally include information in a certain field or a particular technique (Wikipedia). In a teaching learning process a handbook takes a crucial place as it functions as the syllabus of teaching where students and teacher base upon the teaching content for the classroom interactions (Solikhah & Budiharso, 2020; Wu, Cheng & Koszalka, 2021).

A handbook will also integrate multimedia content that stresses technology, science and engineering as the foundations of expertise. Various multimedia educational programs have been developed to overcome the observed problems in multiple disciplines (Bursal & Polat, 2020; Harland, 2011). Various media types and techniques are used with the goal of creative problem solving (Mainali, 2021). Students can be encouraged with electronic learning tools like Facebook and YouTube to produce content on socio-political topics.

In the digital era, nearly every university claim to utilize the internet and its opportunities to improve and promote the traditional type of classroom learning (Bursal & Polat, 2020; Harland, 2011; Ollesh, et. al. 2017). Term e-learning was coined and created a bit of hype in the mid-90s after the advent of the World Wide Web. Some individuals believed that major changes were soon to occur in the educational environment. The question of whether the use of technology for multi-media teaching will really make learning more interesting and innovative has not been fully resolved (Cho & Kim, 2020; Ollesh, 2017; Harland, 2011).

The main application of multimedia in the STEM handbook is math/science textbooks. STEM handbook is the tool necessary to meet college entrance requirements. The STEM Handbook is beneficial because it can be used for a variety of classes and labs, and requires students to record their results after conducting the experiment (Ollesh, et. al., 2017; Harland, 2011). Research indicates that students also learn the same contents when teachers employ problem-based projects and research-based laboratories, but they also learn advanced thought and the crafts to overcome cases (Drake and Long 2009; Tarhan et al. 2008; Wong and Day 2009). In STEM studies, PBL and investigation are significant. The traditional approach also depends on teachers (Taraban et al. 2006). The instructors determine what the learners are going to learn and addresses the questions or problems. Even though students are conducting a wide range of problem-solving activities; they are not designing the experiments themselves. STEM increases motivation and makes them more likely to produce high quality work (Marcus et al. 2010; Harland, 2011; Wu, Cheng & Koszalka, 2021).

STEM offers helpful guidelines for learning and teaching with technology. The Internet is truly making our world more united because of all the information that is shared and the collaboration using free Web 2.0 tools. Users are now able to share and rate information (Harland, 2011; Wu, Cheng & Koszalka, 2021). The technology icon brings your attention to the use of computers, cell phones, and technologies in research. An interactive multimedia would be useful for instructional setting as the students themselves can choose the information they would like to obtain at their own pace. Multimedia learning systems do not replace teachers. In such a scenario, teachers' role should be limited (Mainali, 2021).

The multimedia system must be built to emulate the best teachers by integrating cognitive processes elements and the best technical quality. With multimedia computer program courses, programs can be built and changed with little effort. Multimedia can strengthen and enhance creativities in the operational use and science classroom, applying novel instrument to teach science concepts and media literacy technology (Ollesh, at. al, 2017; Harland, 2011; Wu, Cheng & Koszalka, 2021). Photo-sharing, video-publishing and map-making as the digitalized media can be used to perform student mastery of a concept and reinforce their literacy skills (Harland, 2011). Many schools claim to be using technology such as the internet to create a more effective educational system where "e-learning" was coined to be very hyped to change the educational environment (Ollesch, at. al, 2017; Harland, 2011; Wu, Cheng & Koszalka, 2021).

Methods

Research Design

This study used the R&D approach to the development of a manual for technology integration based on a survey of the status of technology integration in schools, including obstacles that hinder the integration of technology for teachers into their lessons. This was a descriptive study that compared pre-testing to post-testing. It also involved a pre-test post-testing group study. In order to see the perception of teachers, the descriptive design was applied and the experimental design was applicable to see the effectiveness of the handbook. In order to accomplish such a goal, the author of this paper would like to create a handbook of STEM mathematics focused on teaching strategies. Furthermore, the handbook sorted the different effect of the use of handbook and conventional textbook on the achievement of students. The data in this study are summarized using descriptive statistics, t-test processed using ANOVA test, that are processed using statistical software. The research was conducted in Sukoharjo, Indonesia, for public elementary school students, with tutorial classes in mathematics.

Participants

The study participants were made up of 24 elementary mathematics teachers. The participants were recruited using purposive sampling involving 6 elementary public schools. The participants joined a series of workshops served by the researchers for this research on their own motivation and awareness. The teacher participants used the handbook to participate in the development process of the handbook and mathematical lesson tutorial. In addition, 62 elementary school students were involved in the need for an experiment that sees the efficacy of the handbook. School 1 was recruited as a group of experimental students to involve 30 students and the remaining 32 students performing as the controlled group were recruited from school 2.

Research Instruments

In this study, two different types of equipment were used to collect the data. To see what a view of the application of STEM, a survey questionnaire was developed to reveal the educators' perspective. Questions within the questionnaire, which were evaluated using Likert scales of 5 points, were rated with 1 being the least and 5 being the most impressive. The survey questionnaire had 20 items, each with a Likert scale. In pre-testing all N=20 teachers were asked to have a look at the questionnaire and gave us their feedback. We made sure it was clear and as easy to understand as possible. The tests using KMO had valid items, showing a .772 correlation, and reliable scores showing Cronbach Alpha coefficient of .890. The second test open-ended test was on the topics of math, consisting of 10 items of short response items and 1 essay question. The validity and reliability of the test were obtained through piloting to 10 students from school 3. The results showed that the validity of the test was .842 and the reliability of .873.

Techniques to Collect Data

To collect data, the researchers used two techniques. Teacher opinions on the use of a handbook were collected based on survey evaluations. In addition to collecting scores of students on mathematical tests, data on their comprehension of the book was also recorded. The teacher correspondents for the questionnaire were established, all students in the tutorial class tested shared these views, and all results were unanimous. Response to the teacher survey was coded and analyzed using descriptive statistical analysis. The paired t-test was used to see the different achievement on mathematical performance. This is a group pre-test post-test experimental study, wherein the experimental group will receive a pretest and control group will receive a posttest. The scores on pre-test were collected at the beginning and post-treatment scores were collected at the end of the treatment.

Techniques to Analyze Data

The researchers used descriptive statistics and a t-test to analyze the data, operating a one-way ANOVA test, version 17 with SPSS software. To find the frequency, rate percentage, and the mean scores to represent the numerical data obtained from the 5-point Likert scale response, descriptive statistic calculation was applied. The criteria for the Likert scale were as follows: certainly Favorable (4.20-5.00); Favorable (3.40-4.19); Abstain (2.60-3.39); Not Favorable (1.80-2.59); definitely adverse; (1.00-1.79). Furthermore, the hypothesis testing that demonstrated the handbook's efficacy was assessed using the paired t-test. A one-way ANOVA was performed on the data when comparing the pre-test and post-test test grades. The normality and homogeneity tests to see the normal distribution of data and their homogeneity were applied prior to the hypothesis tests.

Results and Discussion

Teacher Perception on Teaching Methods and Technology

Table 1 shows the teachers' preferred teaching methodology. The methodology preferred by one half (50%) of those surveyed is student-centered. Most schools in Sukoharjo have limited computers and some do not even have computer laboratories that the students can use. Most of the teachers have expressed their eagerness to use technology and most of them believe in the benefits that can be gained by the students from technology. However, they feel more confident if they are equipped with enough resources and the necessary skills to successfully integrate technology in their classes. The figure of teacher perception on teaching method appears in Table 1.

Table 1. Teachers' Preferred Teaching Methodology

Preferred Teaching Methodology	Frequency N=24	Percentage
Generally organized by the teacher	1	4%
Individual learning method	6	25%
Group based teaching methods	3	13%
Technology based methods in individual	12	50%
Technology based methods with collaboration	2	8%
Total	24	100%

As Table 1 suggests, teachers indicate that technology teaching method has been used by the teacher up to 58%. However, the teacher tends to apply individual based-technology (50%) and group based technology (8%). Individual based technology allows the teacher to teach individual student using handphone, or video call. It is considered easy to do because teacher can supervise and explain each topic definitely. This finding confirms that most teachers (50%) are pleased to use this method. In the group based teaching, teachers should operate a greater use of the virtual tool. This makes teacher serve their materials and control over students during the classroom interactions. Teachers perceive that this method is more complicated so that a few teachers (8%) like to do this method. This study confirms, in line with Reinhold et al. (2020) and Harland (2011), that the use of STEM is useful for educational innovation and especially important for teaching numerical topics in mathematical learning. In primary education, the role of technology in mathematics supports encouragement (Domingo and Garganté, 2016) and establishes the effectiveness of touch screen technology (Aladé et al., 2016).

Data on Table 2 shows teacher's perception on classroom technology. Opinions are shared in response of classroom technology.

Table 2. Instructors' Perceptions on Classroom Technology Usage

	Classroom Technology Usage	**Mean**	**Interpretation**
1.	Expands scholarly accomplishment (e.g grades)	3.83	Agree
2.	Results in understudy dismissing significant conventional learning assets (e.g library books)	2.92	Slightly Agree
3.	Promotes student collaboration.	3.71	Agree
4.	Makes classroom management more difficult.	3.42	Slightly Agree
5.	Advances the improvement of relational abilities (e.g composing & introduction abilities).	3.92	Agree
6.	Is a valuable instructional tool.	4.04	Agree
7.	Causes instructors to feel more skillful as teachers	3.96	Agree
8.	Offers educators the chance to learn facilitators rather than educational suppliers	4.25	Agree
9.	Is a viable device for understudies, everything being equal	3.67	Agree
10.	Is pointless because understudies will acquire PC abilities all alone, outside of school.	3.38	Slightly Agree
11.	Facilitates the tension on the educator	3.88	Agree
12.	Helps accommodate student's learning style	3.96	Agree
13.	Persuades understudies to get more engaged with learning exercises	4.21	Agree
14.	Promotes the development of students' interpersonal skills (e.g, ability to relate or work with others)	4.13	Agree
15.	Expands the measure of pressure and nervousness understudies insight	3.58	Agree
16.	Improves students' learning of critical concepts and ideas.	4.13	Agree
17.	Turns out to be more critical to the educator if the understudy doesn't approach a PC at home	2.25	Agree
18.	Is too costly in terms of resources, time, and effort.	2.29	Disagree
19.	Enhances the teachers' professional development.	4.25	Disagree
20.	Is viable if educators take an interest in the determination of PC advances to be coordinated.	2.13	Disagree

We found that with respect to mathematics teaching, it is evident that the use of technology is essential. The use of a handbook about how to teach mathematics is useful for the needs of a recent teaching of mathematics. This research is in agreement with some studies as stated by Harland (2011) and Wu, Cheng & Koszalka (2017). Despite the fact that the purpose of a mathematical education is to help in solving real world problems and beyond, the curriculum has always been to pass mathematics beyond school. Of the 62 students in the current study, the results produced seem to imply that the standard elementary school education, which was developed in the early 20th century, is not as effective as proposed in the recently developed science curricula, such as STEM. While this research cannot completely conclude that multimedia technology is the best way to make learning more enjoyable, it does state that a basis for further investigation still exists (Cho & Kim, 2020; Ollesh, 2017; Harland, 2011; Wu, Cheng & Koszalka, 2021).

Validation of the Handbook Result

The result of the validation of the multimedia materials developed which was conducted by a panel of experts proves that the materials developed by the researcher are valid in terms of content and functionality (see Table 3).

Table 3. Validity of Multimedia Materials

Criteria	Mean	Interpretation
Technical	3.00	The undertakings work successfully with minor issues.
Navigation	3.67	Clients can advance by themselves in an intelligent way to discover data. All routs and snags work.
Spelling and Grammar	3.33	Venture satisfactorily praises spelling and sentence structure (two or fewer blunders)
Use of Enhancements	3.33	Most designs or different upgrades are utilized fittingly to enhance the experience.
Curriculum Alignment	4.00	Clear proof association with target educational plan. Clients will gain from this venture.
Evidence to meet the	3.67	Clear proof that venture content backings expressed targets.
Depth and Breadth of Content	3.67	Clear proof that more significant levels of reasoning abilities were utilized in the formation of this undertaking.
Subject Knowledge	3.00	Subject information is apparent in a large part of the venture. Most data is clear, suitable, and right.

As Table 3 indicates the handbook received the validation from various aspects. Specifically, 8 aspects of a quality handbook as the learning resources has been fulfilled. The aspects include technical, navigation, spelling and grammar, use of enhancements, curriculum alignment, evidences to meet the objectives, depth and breadth of the content and subject knowledge. This study confirms that all aspects have been defined clearly and the quality of each aspect is satisfied.

Result of the Experiment

Normality Test

The purpose of the normality test is to determine whether the collected data is normally distributed or derived from samples normally distributed (see Table 4).

Table 4. Results of Normality Test of Control Group Pretest-Posttest Data

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_Con	.086	32	.136	.835	32	.092
Post_Con	.080	32	.200*	.837	32	.128

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

The Kolmogorov-Smirnov normality test uses a 0.05 cutoff. If the estimated value is greater than or equal to 0.05 then the data is graded as normal. Table 4 says that the test results are normal. The sig is the product of the control group pre-test score. = 0.176 and sig. posttest. of 0.200. All post-tests are greater than 5%, so that the control group's pretest and posttest data are normally distributed.

Table 5. The Results of the Pretest-Posttest Data Normality Test for the Experimental Group

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_Exp	.091	30	.077	.975	30	.093
Post_Exp	.093	30	.066	.960	30	.011

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Table 5 indicates the likelihood that the test is a proper randomization of the experimental group after the pretest is sig. = 0.77 and a good Sig. = 0.66. As for the results of the two groups, all are greater than 0.05. Therefore, the group data for both before and after will be normally distributed.

Homogeity Test

There was a test of the homogeneity to determine if all the groups measured were of the same quality or were of the same state. If the Sig statistic is greater than 0.05, the data is deemed homogeneous. The smaller the Levene Statistic, the higher the homogeneity (see Table 6).

Tabel 6. Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Pretest	.093	1	62	.760
Posttest	.590	1	62	.443

The data in Table 6 shows the scores on the experimental and control groups. The outcome of the test is significant. 0.760. The groups are homogeneous and have variants at frequencies of 0.05 or more. The post-test score is significant (0.442). The experimental and control groups are not equal in their performance on the experiment.

Hypothesis Testing

Table 7 demonstrates hypothesis testing based on the paired t-test (t-test for paired group) and processed using the SPSS Release 17 program.

Table 7. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper			
Pair 1	Pre_Class1-Post_Class1	-.60000	2.89992	.31454	-1.22550	.02550	-1.670	62	.060
Pair 2	Pre_Class1-Post_Class2	-6.9882	10.28116	1.11515	-9.20583	-4.77064	-6.267	62	.000

The t-test analysis on Table 7 shows the sig. value at .060> alpha for the control group pretest scores and posttest scores (0.05). There is a two-tailed null hypothesis of 0.06 less than .05. The controls and the experiment groups have no significant difference. The posttest scores do not differ from the pretest scores. The posttest scores for the experimental group (t=6.627) is smaller than the critical value of .05, showing the difference on pre-test and post-test. The results differed significantly before and after.

The main outcome of this experiment is significant in improving students' level of knowledge on mathematics. In the experimental group the treatment was administered with the use of a handbook that utilizes STEM as the materials of teaching, whereas in the control group the treatment was administered using conventional materials. The results show that students who are taught using the handbook outperform those who are not. This evidence supports the finding that education possesses the potential to help students develop interests, knowledge, and skills as well as articulating the relevance and meaning of subject matter in learning (Duerr, 2008). STEM has attempted to dissolve conventional disciplines and organize teaching and learning in the context of authentic, real-world themes through transdisciplinary approaches (Exter, Gray & Fernandez, 2019). Teachers from various backgrounds participate in the preparation, teaching and working together in the achievement of common transdisciplinary educational objectives and regularly cross discipline borders (Bursal & Polat, 2020; Harland, 2011; Ollesh, et. al. 2017; Cho & Kim, 2020; Wu, Cheng & Koszalka, 2021).

The results of this study imply that STEM-oriented math textbooks have a significant impact on elementary school students' mathematics learning. It means teachers should be confident of applying STEM methods in their teaching. Empirically, the use of STEM Mathematics Handbook has an impact on student achievement and achievement in three areas of learning mathematics: motivation, enjoyment, and collaborative activities.

Conclusion

It can be argued, given the findings, that most educators have not been trained to use innovation and that it can be used very well for guidance purposes. Many are being re-introduced in a short amount of time, but are not becoming a learning tool with specific software being used. Some PC units have recently been acquired by schools, but these are used to demonstrate PC capabilities and are not used for activities that can help understudies build more capacity for demand-finding. The shortage of assets, therefore, is an obstacle to the reconciliation of school creativity. Another barrier to the introduction of technology in these schools is the lack of experience, since most teachers are not even very aware of the most basic computer applications. In a guide on how to incorporate technology into teaching in the manual established in the report, the needs of teachers in primary schools are addressed step by step. This paper explains how teachers can improve their motivation and how professors can use some these websites.

The model and the accompanying manual are right in terms of functionality and help teachers overcome technological obstacles. Increasing the mean mathematics scores of pupils were also seen in the materials provided, but a substantial difference was only in grades four. The students, however, were keen to learn the subject and complete an exercise that indicates that the content is effectively motivated, which leads to hopes that major gaps can be reached and when used for a longer period and on a wider sample, the interactive material proved beneficial. The conclusion is that the constructivist approach involving learners in the learning process is effective in preparing them to become dedicated learners, providing them with a mechanism to gain knowledge that they can use in the real world. The constructivist theory is thus endorsed by this analysis.

Practical Implications

Students must possess unique and effective teaching approaches in today's technologically driven world. The addition of technological tools to Sukoharjo's schools could enhance the learners' abilities to achieve independent learning. The compounding benefits of convergence should not underestimated. School officials should prioritize funding computer acquisition because not only will it allow staff to focus on more important tasks, students will have access to technology. The study showed that the overall quality and usability of items is most important. The only way to fully integrate changes is through planned, coordinated, and scheduled implementation. Teachers should have periodic computer training sessions in which they gain skills for the use of technology in teaching. School officials should be ready for any technological advancement as it will continually progress. Technology is always a venture that requires investment.

Technology integration would support students and teachers in Sukoharjo primary schools. The following suggestions are therefore provided: (1) not only should teachers be trained to use technology, but also how it can be used to enhance the learning skills of students; (2) school officials should include technology acquisition and training in their growth plans; they should focus on improving the learning environment; (3) while the performance of the participating students has been improved The model should be tried over a considerable period on a greater number of pupils to determine its true effectiveness, and (4) more research should be undertaken to assess the state of technology integration in the area to a considerably broader degree. Therefore, the model should be tested. This can be used as a basis for the implementation and formulation of programs for the incorporation of technologies.

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