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Innovation of Differentiated Flipsains Integrated with STEAM and Tri-N in Increasing Creativity of Elementary School Students

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ABSTRAK

Kreativitas merupakan salah satu keterampilan yang harus dimiliki oleh seseorang agar mampu bertahan hidup di era yang serba ketidakpastian ini. Kreativitas perlu dikembangkan sejak dini termasuk dalam pembelajaran di SD. Penelitian ini bertujuan untuk mengembangkan media flipbook *sains* (flipsains) *berbasis pembelajaran berdiferensiasi terintegrasi dengan pendekatan STEAM dan Tri-N dalam meningkatkan kreativitas siswa SD. Metode penelitian ini menggunakan penelitian pengembangan dengan tahapan ADDIE:* analysis, design, development, implementation, *serta evaluation. Subjek teliti pada penelitian ini adalah siswa kelas IV SD yang berjumlah 17 siswa pada uji coba terbatas dan 56 siswa pada uji coba luas. Teknik pengumpulan data pada penelitian ini dilakukan dengan teknik observasi, wawancara, dan kuesioner. Teknik analisis penelitian ini dilakukan dengan deskriptif kualitatif dan kuantitatif. Hasil penelitian ini menujukkan bahwa dihasilkan media flipsains dengan karakteristik berbasis pembelajaran berdiferensiasi yang didesain dengan terlebih dahulu adanya asesment awal, dilengkapi dengan beragam macam video dan ragam projek. Flipsains yang dikembangkan juga dikembangkan sesuai dengan unsur pendekatan STEAM dan Metode Tri-N. Hasil validasi menunjukkan bahwa flipsains yang dikembangkan dikatakan valid dengan hasil validasi sebesar 90,2% dengan kriteria sangat layak. Flipsains yang dikembangkan juga terbukti efektif dalam meningkatkan kreativitas siswa SD yang dibuktikan dengan meningkatnya skor hasil observasi dari keterampilan kreativitas siswa pada uji coba terbatas dan uji coba luas.*

ABSTRACT

Creativity is one of the skills that a person must have in order to survive in this era of uncertainty. Creativity needs to be developed from an early age, including in elementary school learning. This research aims to develop science flipbook media (flipsains) based on differentiated learning integrated with STEAM and Tri-N approaches in increasing elementary school students' creativity. This research uses a development research method with ADDIE stages: analysis, design, development, implementation, and evaluation. The subjects studied in this research were fourth grade elementary school students, totalling 17 students in the limited trial and 56 students in extensive trial. Data collection techniques in this research were carried out using observation, interviews and questionnaires. The analysis technique for this research was carried out using qualitative and quantitative descriptive methods. The results of this research show that flipsains media was produced with characteristics based on differentiated learning which was designed with an initial assessment, equipped with various kinds of videos and various projects. Flipsains was also developed according to elements of the STEAM approach and the Tri-N Method. The validation results show that the flipsains developed is said to be valid with validation results of 90.2% with very feasible criteria. The developed flipsains has also proven to be effective in increasing elementary school students' creativity as evidenced by the increase in observation scores of students' creativity skills in limited trials and extensive trials.

1. INTRODUCTION

Creativity is a skill that a person must have in order to survive and adapt in this disruptive era. A creative person will be able to create brilliant ideas as alternative solutions to the problems they face (Aladwan et al., 2023; Yuniharto & Nisa, 2022). Creativity needs to be developed from an early age, including

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in the learning process in elementary school. Teachers need to have good skills in designing learning to be able to maximize student creativity, including in developing media and various learning resources (Hau et al., 2020; Istiq'faroh et al., 2020; Sudarsana, 2017). However, based on the results of observations and interviews that have been conducted, it shows that the creativity possessed by elementary school students is still low. Students still do not have the ability to create ideas in the learning process. Students also still do not have the confidence to express their opinions in public. Students tend to follow the directions given by the teacher without having the initiative to be creative. The results of the survey also show that there is a problem regarding the lack of utilization of media used in the learning process in elementary schools which prioritizes the use of current technological media (Achilleos et al., 2019; Meyers et al., 2013). This is shown by survey data of 68,8% of teachers do not using digital-based learning media and 69,8% of teachers do not having and developing learning media that can facilitate student differentiation and creativity.

Teachers have obstacles in preparing and using learning media that can stimulate student creativity. Survey data also shows that 55,8% of teachers have never carried out differentiated learning so that the learning carried out in the classroom does not show learning facilities that can accommodate the interests, talents and creativity of students who have various characteristics (Yang et al., 2022; Ye & Xu, 2023). Teachers have not innovated in the use of today's media which can facilitate the diversity of characteristics or differentiation, and creativity of students. The survey results also showed that 97.7% of teachers realized that good learning media design was needed in order to bring out the creative dimension in students. Apart from that, it is also to be able to display their talents and interests, as well as to encourage students to be more enthusiastic in learning and digesting the material.

An alternative solution that can be implemented is by innovating learning that is adaped to students' talents and interests, namely by innovating learning media that is able to facilitate student diversity. Flipbook is one of the contemporary learning media innovations that is suitable for the development of elementary school students which was developed in accordance with current technological developments (Hiralda & Zulherman, 2023; Wati et al., 2021). The selection and use of this flipbook plays quite a role in helping students understand the material. Teaching materials are equipped with evaluation questions that can support students' understanding. The teaching materials already contain evaluation questions that are in accordance with the content of the material and learning objectives The teaching materials are clear enough in providing instructions for working on questions (Hiralda & Zulherman, 2023; Martatiyana et al., 2022).

This science flipbook is designed with differentiation-based learning, namely a learning process that is carried out by facilitating the diversity of students in the class. Through differentiated learning, it is believed that it can increase the potential of students because learning is carried out on the basis of the students' interests and talents (Mulyawati et al., 2022; Sunarsih. & Nisa, 2023). There are three aspects that must be considered in differentiated learning, namely content, process and product. Content differentiation is a learning process carried out by facilitating material diversity. This diversity of content is prepared by paying attention to aspects of students' learning readiness, interests and learning profiles. Based on this data, the teacher then maps students' learning needs, such as students' learning style tendencies, which are then expressed in varied learning materials according to the results of the needs analysis carried out (Al-Shehri, 2020; Naibaho, 2023).

Process differentiation is a learning design that is carried out by paying attention to aspects of variations in learning activities such as tiered activities, variations in activities such as group work, individual work, development of trigger questions, as well as group classifications that are adapted to students' interests and abilities. Meanwhile, product differentiation is evidence of student understanding which can be used to measure the success of the learning process carried out (Faiz et al., 2022; Gaitas et al., 2022). The implementation of differentiated learning in this research is also integrated with STEAM approach. The STEAM approach is a breakthrough in the world of education that integrates several elements of science into one unified learning concept. This approach is believed to be able to foster student creativity because its implementation requires students to be active in learning and familiarize students with studying multidisciplinary knowledge in solving problems (Averina & Mayarni, 2022; Buinicontro, 2018; Pardimin et al., 2023).

In order to implement a good STEAM approach, its implementation is assisted by Tri N method. Tri N is Tamansiswa teaching which consists of three stages, namely *niteni, niroake,* and *nambahake*. The implementation of these three stages can increase student creativity because at the *nambahake* stage, students are given the freedom to explore ideas, thoughts or creativity in their work (Nisa et al., 2019; Pardimin et al., 2023). The novelty of this study is integrating tri-n approach in science flipbook media. This research aims to develop science flipbook media (flipsains) based on differentiated learning integrated with STEAM and Tri-N approaches in increasing elementary school students' creativity.

2. METHOD

This research uses a development method with ADDIE stages: analysis, design, development, implementation, and evaluation (Branch, 2010). At the analysis stage, researchers carried out a needs analysis by observing the learning process carried out, observing the creativity attitudes possessed by students, interviewing teachers regarding the needs needed in learning in order to increase creativity, and conducting a survey of the learning process that had been carried out. The results of the needs analysis at the analysis stage are used as the basis for the next stage, namely the design stage. At this design stage, researchers analyse the framework of the product being developed, such as determining the characteristics of the product being developed, determining the basis of the product being developed, as well as compiling research instruments and validating them by evaluation experts. The results of activities at the design stage are then used as the basis for the develop stage. At this stage, researchers began developing a product in the form of flipsains based on differentiated learning integrated with STEAM and Tri-N to increase the creativity of elementary school students. After the product is developed, the product is then implemented. At the implementation stage, the product is validated by experts in the elementary learning media field and natural science material field. The product results that have been declared valid are then subjected to limited trials, revised and extensively tested. At the evaluation stage, the implementation of the product that has been developed is evaluated. The subjects in this research were 17 students at SDN GBN and 56 students at SDN SA1. Data collection techniques in this research were carried out using observation, interviews and questionnaires. The analysis technique for this research was carried out using qualitative and quantitative descriptive methods.

3. RESULT AND DISCUSSION

Result

This research was carried out by conducting a needs analysis of the conditions in advance. The results of the needs analysis show that differentiated flipsains is needed to increase student creativity. The data from the needs analysis was then used as a basis for developing flipsains and a STEAM-based flipsains integrated with Tri N was determined. The results of this research showed that a science flipbook was produced with characteristics based on differentiated learning, integrated with STEAM and Tri N. The developed flipsains contains elements of science, technology, engineering, art and mathematics. The science aspect can be seen from the science content or material presented in the flipbook, namely substances and changes in the state of substances in science in grade IV elementary school. This content is also integrated with technology, the implementation of which is carried out by providing reinforcement related to the use of technology related to substances and changes in the form of substances, utilizing technology-based learning media such as video playback, and the use of other contemporary media. The implementation of the engineering aspects of the developed flipsains is outlined in activities in the form of techniques such as techniques for making pudding, techniques for making simple water purification tools, and so on. The implementation of the art aspect is implemented by inviting students to sing along with lyrics appropriate to the material, providing evaluation questions that are integrated with pictures, students are also given the freedom to be creative in making puddings as well as experimenting with changes in form in making puddings. The implementation of the mathematical aspect of the developed flipsains is integrated by measuring and considering the ingredients used in the experiment, such as how many millimetres of water are needed to make pudding, how many grams of sugar are used to make a delicious pudding, and so on.

The STEAM approach in the product being developed is also integrated with the Tri N teachings, namely *niteni, niroake* and *nambahake*. This Tri-N activity is implemented by first providing content concepts related to substances and changes in the state of substances and students *niteni* the content or material that students must achieve. The *niroake* stage is implemented by students carrying out experiments in order to implement the concepts they have mastered. This activity is carried out by inviting students to experiment with making pudding and making a simple water filtration device. Meanwhile, for the *nambahake* stage, students are given the opportunity to be creative in making work according to students' interests and preferences, which can be in the form of pictures, posters, poetry, rhymes, comics, songs, or others. The implementation of differentiated learning is outlined through process differentiation, which is first assessed by asking about learning styles that are integrated with games, such as: who likes learning by drawing a lot, please move forward. Who likes to learn with lots of stories then hold his ears, and who likes to learn with lots of singing then shake on the spot, and so on. Apart from process differentiation, the product being developed is also designed with differentiation in the form of being creative in making works according to students' interests and preferences, in the form of pictures, posters, poetry, rhymes, comics, songs or others. Meanwhile, content differentiation is implemented with variations in material presented in the form of written material and audio-visual material in the form of videos.

The input/suggestion provided by material experts includes strengthening the stages in technological aspects according to material and substance changes. The next input/suggestion is related to more concrete visualization of the material. The validation results from material experts are as follows. The product developed is proven to be valid with the validation data as show in Table 1 and Table 2.

Table 1. Validation Results of Material Expert

No	Component	Score
1	Feasibility of Content	4.67
2	Feasibility of Presentation	4.71
3	Feasibility of Language	4.5
4	Contextual	4.67
	Average	**4.63**
	Percentage	**92.5%**

Table 2. Validation Results of Media Expert

No	Component	Score
1	Form	4.6
2	Instructional Quality	4.67
3	Effectiveness	3.67
4	Presentation	4.67
	Average	**4.4**
	Percentage	**88.05%**

Based on Table 1 and Table 2, the average validation result is 90,2% with very feasible criteria. Based on input from experts, the product is then revised and tested in limited and extensive trials. The input/suggestion provided by media experts includes cover visualization, numbering writing procedures, and strengthening the implementation of differentiation at the start of learning. The input is then corrected and then the improved product is used for effectiveness trials. The results of the implementation of the product developed have also proven to be effective in increasing student creativity, which can be seen in Table 3.

Table 3. Data on Creativity Effectiveness Results

No	Element	Limited trial	Extensive trial
1	Generating Original Ideas	3.2	3.6
2	Producing Original Work and Actions	3.5	3.8
3	Have the flexibility to think in finding alternative solutions to problems	3.1	3.5
	Average	**3.26**	**3.63**

Based on Table 3, it can be concluded that flipsains has proven effective in increasing student creativity, this is proven by an increase in the average creativity score from 3,26 in limited trials to 3,63 in extensive trials. This creativity is enhanced through science learning activities designed based on student centres and case method or project based which are implemented through an integrated STEAM approach with Tri N. STEAM which is integrated with Tri N is believed to be able to support the implementation of the independent curriculum including increasing the creative dimension of elementary school students

Discussion

This research examines Flipsains learning innovations that are integrated with the STEAM (Science, Technology, Engineering, Arts, Mathematics) approach and the Tri-N concept (*Niteni, Nirokke, Nambahi*) in an effort to increase the creativity of elementary school students. The STEAM approach emphasizes interdisciplinarity between science, technology, engineering, arts, and mathematics (Khaningrum & Nisa, 2023; Oktaviah et al., 2023). In the context of Flipsains, the application of STEAM introduces students to various concepts and skills through projects and activities that are interesting and relevant to everyday life. For example, students can create projects that involve physics and mathematics principles while also developing aspects of visual arts or technology design (Ardilansari. et al., 2023; Pardimin et al., 2023). In this way, students not only learn theoretical concepts but also how to apply them in practical situations, which encourages creative and innovative thinking.

Tri-N, which consists of Niteni (observe), *Nirokke* (imitate), and *Nambahi* (add/develop) is a learning approach rooted in local culture that teaches students to observe carefully, imitate as the first step in learning, and then develop or modify according to their own understanding and creativity. The successful implementation of Flipsains which is integrated with STEAM and Tri-N is very dependent on the teacher's role as a facilitator and motivator (Sarjana et al., 2020; Tri et al., 2021). Teachers need to have a deep understanding of the STEAM and Tri-N approaches and the ability to design and manage learning activities that support the development of student creativity. Apart from that, the availability of supporting facilities such as science laboratories, technological tools and art materials also plays an important role in creating a conducive learning environment (Reidsema et al., 2017; Wijayanto & Zuhri, 2014). Flipsains' learning innovation which is integrated with STEAM and the Tri-N concept has proven to be effective in increasing the creativity of elementary school students. This approach not only enriches students' learning experience but also prepares them to face future challenges with critical and creative thinking skills. Successful implementation requires support from various parties including teachers, schools and society as a whole.

This strengthens the research conducted by study which shows that STEAM is able to increase students' creative dimensions and has a positive impact on providing very significant learning experiences for students, including increasing students' learning motivation (Ahmad et al., 2021; Habibi, 2023). STEAM is also designed so that the learning process is carried out by integrating multidisciplinary knowledge so that students can implement the learning process which is carried out and can equip students to face various problems in real life while also increasing children's imagination abilities (Conradty & Bogner, 2020; Nipriansyah. et al., 2021). The teacher's ability to innovate learning is also included in the pedagogical abilities that teachers must have. Designing a differentiated learning process is also one of the competencies that teachers must have as proof of professionalism. This also supports previous research which shows that there is an impact of using differentiated learning on teacher professionalism and is believed to be able to improve the quality of learning (Afandi et al., 2023; Ismajli & Imami-Morina, 2018; Shareefa, 2023).

The success of differentiated learning is also supported by the use of learning media which is able to facilitate the diversity of students' interests as a form of differentiated content and process. This Flipbook also supports the achievement of differentiated learning because this media is believed to increase students' interest in learning and be able to prepare students to face learning in the 21st century, including the ability to increase students' creativity (Hiralda & Zulherman, 2023; Melesse & Belay, 2022; Roemintoyo. & Budiarto, 2021). The results of this research also support previous research which explains that differentiated learning is also able to improve students' critical thinking skills and is able to increase students' potential according to their talents and interests (Pozas et al., 2020; Sahril. et al., 2021).

This research shows that the integration of the Differentiated Flipsains learning model with the STEAM (Science, Technology, Engineering, Arts, and Mathematics) and Tri-N (Reason, Intention, and Guts) approach is effective in increasing elementary school students' creativity. This implies that this approach could be adopted more widely to facilitate the development of creativity at the primary education level. The implementation of Differentiated Flipsains provides a more personalized learning experience tailored to individual student needs. This means that educators must consider more flexible and differentiated approaches to teaching, rather than just one-size-fits-all methods. However this research may only involve a small number of elementary schools or certain classes. Generalization of study results to a wider population may need to be done with caution. The limited research duration may not be enough to see the long-term impact of implementing the Differentiated Flipsains method integrated with STEAM and Tri-N on student creativity. It is possible that the implementation of this method may vary from one school to another, depending on the capabilities and availability of resources at each school.

4. CONCLUSION

Based on the explanation above, it can be concluded that the product produced is a science flipbook with characteristics based on differentiated learning, integrated with STEAM and Tri N. Flipsains which has been developed has been proven to be valid and effective in increasing the creativity of elementary school students.

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