

Natural and Social Science (IPAS) Learning in Elementary Schools Using Interactive Media to Enhance Student Motivation

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ABSTRACT

Integrating Natural and Social Sciences (IPAS) in elementary education often faces challenges regarding student engagement with complex and abstract materials. This study aims to evaluate the effectiveness of an innovative interactive media called KuPin, an AI based chatbot application, in increasing student learning motivation. KuPin is designed to provide a conversational learning experience, allowing students to ask questions, receive instant feedback, and explore IPAS topics through a friendly and interactive interface. The research follows a Development Research (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The findings indicate that the use of the KuPin chatbot significantly transforms the learning atmosphere into a more personalized and interactive environment. Students showed a high level of curiosity and persistence when using the chatbot compared to traditional textbook-based methods. Statistical analysis reveals a notable increase in learning motivation scores, suggesting that the "Kucing Pintar" chatbot serves as an effective digital companion for young learners. In conclusion, KuPin successfully bridges the gap between technology and pedagogy, providing a fun and accessible tool to boost student enthusiasm in IPAS education.

INTRODUCTION

Education is an essential part of children's development. Its purpose is to instill all the natural strengths in children so that they may achieve the highest possible level of safety and happiness as human beings and members of society. Known as the Father of National Education and the founder of the Taman Siswa School, Ki Hajar Dewantara's educational philosophy has served as the foundation for many contemporary educational policies in Indonesia, such as the 2013 Curriculum and the Merdeka Curriculum (Yanuarti, 2018).

The importance of education in the effort to eradicate ignorance, combat poverty, and improve the standard of living for all segments of society, and building the dignity of the nation and people, the government is therefore striving to give serious attention to addressing various issues in the field of educational improvement, from the elementary and secondary levels through to higher education (Fahmi, 2022).

The current learning paradigm is shifting from traditional learning (knowledge transfer), which is teacher-centered, to innovative learning (knowledge construction), which prioritizes students. This new paradigm highly values individual differences, as there are inevitably significant variations in ability within a single classroom. Consequently, this paradigm fosters the creation of a learning community within educational activities to ensure the principle of education for all, guaranteeing that education is a right for everyone, not just children considered to be gifted. This new paradigm, based on contextual learning theory, helps students connect the concepts they learn with all the experiences and knowledge they possess in their daily lives. This relates to the meaningfulness of learning.

The Ministry of Education, Culture, Research, and Technology has been working to improve the quality of education through the development of a curriculum known as the "Merdeka Curriculum." In this Merdeka Curriculum, the teaching of Natural Sciences (IPA) is combined with Social Sciences (IPS) to form Natural and Social Sciences (IPAS) at the elementary school level for several reasons: elementary school students can view things holistically and in an integrated manner, and this strengthens the profile of the Pancasila learner. The learning objectives of IPAS in this curriculum are to foster interest and curiosity, encourage active participation, develop inquiry skills, help students recognize themselves and their environment, and build knowledge and conceptual understanding of IPAS (Agustina, et al 2022).

Theoretically, the influence of the media on motivation can be explained through Self-Determination Theory by (Ryan & Deci, 2020). Interactive media provide students with the autonomy to set their own learning pace (self-paced learning). When students feel they are in control of their learning process through digital media features, their intrinsic motivation naturally grows. Additionally, gamification elements in modern media—such as points, levels, and instant feedback—can enhance students' sense of competence, which, according to Schunk et al. (2014), is one of the key pillars in sustaining students' persistence when facing challenging tasks.

Furthermore, the use of technology-based media (such as Android apps) can generate strong situational interest Herawan et al, (2022) states that fleeting interest sparked by engaging media can develop into a lasting interest in the individual if supported by meaningful content. In this context, media acts as a bridge connecting the subject matter to students' real-world experiences, making learning feel more relevant. It is this synergy between the visual appeal and ease of access offered by media that ultimately transforms students' learning potential into active engagement in the classroom (Mayer, 2021).

The availability of interactive learning tools, such as the chatbot from the Smojo.ai app, as a learning resource—particularly within the Merdeka Curriculum—can support students' learning process in IPAS, especially through the use of the KuPin feature from the Smojo.ai app.

One of the causes of declining motivation is material that is too easy (boring) or too difficult (frustrating). Therefore, the strength of the Smojo.ai app lies in its ability to adapt to students' comprehension levels. Based on the background described above, a study was conducted titled "Natural and Social Science (IPAS) Learning in Elementary Schools Using Interactive Media to Enhance Student Motivation.

LITERATURE REVIEW

A dynamic educational paradigm has transformed teaching approaches in elementary schools. Learning is no longer limited to passive interactions between teachers and students, one-way delivery of material in formal classrooms, or textbooks as the sole learning resource. Instead, the current focus of learning is on active, contextual, and enjoyable exploration, particularly in nature-based school environments that rely on direct interaction with the surrounding ecosystem and are supported by increasingly advanced technology that can aid students' learning processes. To meet these demands, there is a need to develop interactive learning media that can sustain students' motivation to learn while integrating abstract concepts into real-world experiences.

One highly relevant theoretical framework for explaining how motivation and knowledge are developed in students is Self Determination Theory, developed by Ryan and Deci (2000). This theory emphasizes that the fulfillment of basic psychological needs namely autonomy, competence, and relatedness—is key to enhancing students' intrinsic motivation.

Broadly speaking, media refers to the people, materials, and events that create the conditions enabling students to acquire knowledge, skills, or attitudes (Yusnita et al., 2016). In this sense, teachers, textbooks, and the school environment are all forms of media. Media is one of the components of communication, serving as a carrier of messages from the communicator to the recipient (Daryanto, 2010). Media encompasses anything that can be used to convey messages and stimulate thought, arouse enthusiasm, attention, and motivation in students, thereby fostering the learning process (Fatria, 2018).

Instructional media serve many functions. These instructional media can be used (Guan et al., 2016). The function of instructional media is to serve as a teaching aid that influences the conditions and environment organized and

created by the teacher. In addition to this view, Sanaky (Suryani, 2018) states that instructional media serve to stimulate learning by: 1) Presenting real objects, 2) Creating replicas of real objects, 3) Transforming abstract concepts into more concrete ones, 4) Aligning perceptions, 5) Overcoming barriers of time, place, quantity, and distance, 6) Consistently presenting information, 7) Creating a fun and engaging learning atmosphere so that learning objectives are achieved.

A chatbot is a computer program designed to interact with humans via text or voice messages. Chatbots are typically equipped with artificial intelligence and natural language processing, making them intelligent computer programs capable of answering questions posed by humans. Chatbots are built around topics that have been modeled within a knowledge base. Many existing chatbots are built around specific topics and problems that individuals or businesses aim to solve, such as chatbots that handle academic affairs for students. These chatbots incorporate knowledge models to answer questions within the context that has been established (Iswandi, 2018).

A chatbot also known as a talkbot, chatterbot, or chatbox – is a computer program designed to simulate conversations with humans, primarily over the internet. The term “Chatterbot” was first coined by Michael Mauldin (the creator of the first Verbot) in 1994 to describe conversational programs. The author’s primary goal for these conversational programs was to create an advanced tool capable of conducting conversations in such a way that users would not realize they were speaking with a software program (Maskur, 2016).

Self-Determination Theory, developed by Ryan and Deci (2000), explains that high-quality motivation arises from the fulfillment of three basic psychological needs: Autonomy – the feeling that students have control and choice over their own actions, Competence is the need to feel effective and capable in performing tasks and facing learning challenges; Relatedness is the need to feel connected, meaningful, and supported by the surrounding social environment.

According to Pangestu & Akhiruyanto, (2023) motivation is the process of stimulating and reinforcing motives so that they can be translated into concrete actions. Motives and motivation are inseparable in behavior; thus, motives and their supporting factors are integrated into a concept tailored to students’ needs to progress rapidly. Motivation, as defined by (Nafiati, 2021) is the physiological and psychological state within an individual that drives them to engage in specific activities to achieve a goal aligned with their needs.

Based on the experts’ definitions above, I can conclude that motivation is a set of efforts – whether in the form of words, examples, or interactions, to create a specific state in a person that compels them to continuously take action; thus, motivation can flow from external sources or from within the individual, which is determined by reasons, needs, or desires in learning and practice, thereby becoming the primary driver for students that makes learning aligned with their desired goals and achievable.

METHODOLOGY

The development model used in this study is the Research and Development (R&D) model, employing the ADDIE development method. According to Sugiyono (2018), Research and Development (R&D) is a type of research used to produce a product. The method used in this study employs a development model with the ADDIE approach according to Branch. This method consists of five stages: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation.

According to Branch (2009), the R&D research method consists of five steps, known as the ADDIE approach acronym for Analysis, Design, Development, Implementation, and Evaluation. The following figure illustrates the stages of the R&D research process using the ADDIE approach.

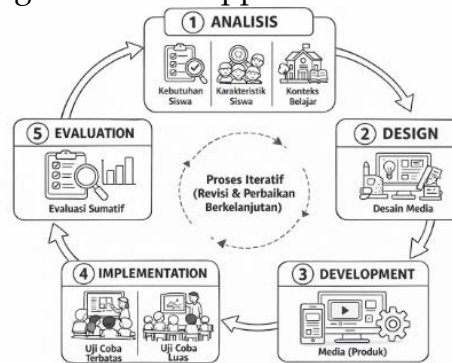


Figure 1 Steps in R&D Research Using the ADDIE Approach According to Branch (2009)

Once the data has been collected, the next step is to analyze it. The data collected must be processed and interpreted immediately so that it can be determined whether the research objectives have been achieved. Data analysis is a critical component of the research process. The choice of data analysis techniques should be aligned with the research design. The research conducted by this researcher uses qualitative descriptive data analysis and quantitative analysis techniques. There are two types of data obtained in this study: qualitative data and quantitative data. According to Miles, M.B. (2014), the activities involved in qualitative data analysis include data collection, data reduction, data presentation, and data interpretation.

RESEARCH RESULT

This section discusses the results of research and development of interactive learning media to enhance motivation in learning IPAS. These research and development efforts have resulted in an interactive medium that can be used in the learning process. The development of this interactive learning media was carried out using the ADDIE model, which consists of five stages: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation (evaluation) (Robert Maribe Branch, 2009).

1. Analysis of the Need for Interactive Media in Enhancing Learning Motivation Among Fifth-Grade Elementary School Students

This study aims to analyze and describe IPAS learning at the two schools under study: Sekolah Alam Amani and SDN Wadas I Karawang. The available

learning materials are limited to required textbooks, supplementary books, and a few worn-out posters or wall charts. These limitations have a serious impact on students' understanding of abstract IPAS concepts. Concepts such as seeing because of light, hearing because of sound, harmony in ecosystems, magnetism, electricity and technology for life, and getting to know the Earth are difficult for students to grasp because they are explained only through two-dimensional images in books or simple diagrams on the blackboard. Students struggle to visualize these dynamic processes, so learning ends up being mere memorization without deep conceptual understanding.

The initial stage in analyzing media needs to enhance IPAS learning motivation at two different schools Amani Nature School and SDN Wadas I—involved a detailed analysis of learning outcomes and learning objectives for Grade 5 IPAS within the Merdeka Curriculum. After analyzing the learning outcomes and learning objectives, the media needs for fifth-grade IPAS learning were identified. The methods used for identification included direct observation and interviews with students and teachers at the two schools: Sekolah Alam Amani and SDN Wadas I.

The analysis was conducted through observations of the teaching materials used in the classroom, as well as interviews with teachers and students and a student questionnaire. The findings revealed a gap between the Merdeka Curriculum policy and actual classroom practice, particularly regarding the availability and use of relevant and interactive teaching materials.

Based on the results of observations and interviews conducted at Sekolah Alam Amani Karawang and SDN Wadas 1 Karawang with fifth-grade homeroom teachers, a needs analysis revealed that in IPAS instruction, some students still struggle with abstract concepts due to a lack of more engaging learning materials, which in turn leads to a lack of student enthusiasm for actively participating in IPAS lessons. The current learning system relies on lecture-based methods and continuous use of textbooks, which fail to capture students' attention and stimulate their interest in learning—factors contributing to their difficulties with energy conversion concepts. Based on this analysis, to make IPAS learning more engaging, enjoyable, and easier for students to understand, the use of learning media is essential.

Interviews with fifth-grade teachers in science education revealed that while they recognize the importance of instructional materials, they face several constraints: limited school budgets for purchasing materials, a lack of training in developing innovative instructional materials, and insufficient time to design and create materials due to a heavy administrative workload. As a result, teachers tend to use the most practical methods even if they are less effective relying on verbal explanations and textbooks.

Next, two fifth-grade teachers from two schools described the challenges they face in teaching IPAS. The biggest challenge is explaining abstract concepts in a way that students can understand. The teachers stated that they often felt frustrated when, despite explaining something repeatedly, the students still did not understand. For example, when explaining the process of the Earth's rotation,

students remained confused about the shape of the Earth, how it rotates, and why this process continues endlessly.

This explanation is supported by Cognitive Load Theory, which distinguishes cognitive load into intrinsic load (complexity of the material), extraneous load (ineffective presentation methods), and germane load (schema-building efforts) (Sweller, 2011). In IPAS material, intrinsic load is often relatively high because it involves concepts, processes, and relationships between components. Good interactive media can reduce extraneous load through relevant visualizations, segmentation of material, and clear instructions and navigation, so that students' cognitive resources can be redirected to germane load – namely, building a more stable conceptual understanding.

In conclusion, this needs analysis confirms that the development of interactive media for fifth-grade students must meet the criteria of flexible access, ease of navigation (practicality), and the ability to stimulate communicative interaction. Such media is expected to serve not only as a vehicle for conveying information but also as a strategic tool in creating a learning experience that is enjoyable (joyful learning), self-directed, and meaningful, thereby enabling students' motivation to learn to increase continuously in accordance with their individual developmental rhythms.

2. Design of the KuPin educational media to enhance the learning motivation of fifth-grade elementary school students

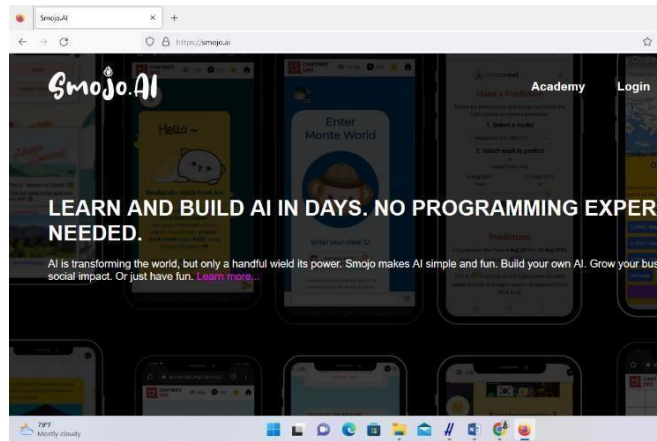
Interactive media is a learning medium that enables two-way communication between the medium and the user. According to (Jahroni & Darmawan, 2022), interactive media is a teaching delivery system that presents recorded video material with computer control to the audience (students), who not only hear and see the video and audio but also provide active responses, and those responses determine the speed and sequence of presentation. According to Yulia et al. (2022), interactive multimedia is defined as a combination of text, graphics, sound, animation, and video delivered via a computer or other electronic devices, where users can control what and when these elements are presented. The main characteristic of interactive media is interactivity, namely the media's ability to respond to user input or actions, provide feedback, and allow users to control the learning process according to their own pace and needs.

KuPin is designed to guide students through a structured learning process: starting with initial attention (apprehension), conceptual understanding through visual representations, interactive exercises for reinforcement, and simple reflection to consolidate understanding. Pedagogically, design decisions that prioritize a clear menu structure, concept visualization, exercises/quizzes, and immediate feedback are a direct response to the learning needs of elementary school students in science, who require segmented, concrete material, as well as learning experiences that foster a sense of competence and a sense of achievement.

The Smojo.AI app also allows users to generate reports. These range from tracking the number of visits to the chatbot to reports on the completion of assignments or quizzes by users, specifically for educational chatbots (Jonathan, 2022). The Smojo.AI app is a coding-based educational content creation tool.

Thus, teachers – referred to as editors – can create chatbots as learning tools by first coding on the Smojo.AI website. The steps for using the Smojo.AI app are as follows:

Figure 2 Initial view of Smojo.AI via the web



First, the editor must access the link <https://smojo.ai/> as shown in Figure 2, which will take them directly to the Smojo.AI web application. On the Smojo.AI homepage, the editor will be prompted to log in. If they do not yet have an account, the editor should click the “Sign Up” button, which will redirect them to the sign-up page to create a new account.

Then click the link, and you’ll be redirected to the chatbot page you’ve created, which will then be reviewed by an editor to ensure its content aligns with the code entered on the intro.m page.

Figure 4.8 Chatbot Interface



In Figure 3 if the chatbot interface matches the content entered on the coding page, return to the coding page and proceed to edit the menu.m page.

After entering and adjusting the content on the menu.m coding page, don’t forget to save the page by pressing Ctrl+S simultaneously. Once saved, return to the main.m page and click the “Publish” button in the top-right corner, which will display the chatbot editor link. Then click that link, and you’ll be redirected to the chatbot page you’ve created, where the editor will verify whether the content matches the code entered on the menu.m page.

Once the chatbot interface matches the content entered on the coding page, the KuPiN tool is ready for use. To ensure that students can use the KuPiN tool effectively in their IPAS learning, a storyboard is needed that illustrates each step of the tool's usage in a clear and easy-to-understand sequence. The creation of this storyboard begins with identifying KuPiN's primary objective: to help students understand learning concepts through engaging visual displays, clear instructions, and interactive exercises that facilitate independent learning.



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The KuPin platform was designed based on an analysis of the needs of fifth-grade students in the concrete operational stage. Its main attractions include an engaging visual design, the use of contrasting colors, and the integration of images and text on the screen. Interactive media that allows students to actively manipulate objects, solve challenges, or play (such as wooden boards, cultural cards, or educational games) has been proven to increase engagement and learning motivation in elementary schools (Dendy, 2025). KuPin, designed as a play-based learning medium, positions students as the main actors, not just listeners.

A storyboard will be developed, covering everything from the media's initial interface, usage instructions, presentation of content, visual examples, to the practice activities students must complete. Through this storyboard, every aspect of the KuPin media can be carefully planned: from how users first interact with the screen interface, how they understand the instructions, to how they complete the available exercises.

3. The validity of the KuPin medium developed to enhance the learning motivation of fifth-grade elementary school students

Although the validation scores indicate a range from acceptable to highly acceptable, the validation process generally results in notes for improvement. In the development of educational materials for elementary school students, notes regarding sentence simplification, font/icon consistency, clarity of instructions, and layout are not merely cosmetic issues, but rather concerns related to accessibility, comprehensibility, and cognitive efficiency. Therefore, expert feedback is treated as evidence for making targeted revisions. The following table summarizes the relationship between expert input and the revision actions taken (or recommended), ensuring the development process is controlled and traceable.

Based on the collaborative assessment results from the three validators, the development of the KuPin media requires harmonization between substantive, aesthetic, and technical functionality aspects. The content expert emphasized the need for content filtering to prevent information overlap, while the media expert suggested that dense text be summarized into key points or visualized through representative illustrations. This synergy aims to ensure that the cognitive load on fifth-grade students is not excessive, thereby maintaining their motivation as the material feels easy to digest yet remains scientifically accurate.

The revisions based on the expert feedback above demonstrate that the development of KuPin follows an iterative process in which the product is tested, critiqued, and then refined. This approach strengthens the research's credibility because it shows that the product's quality is not determined by the researcher's subjective preferences, but rather by measurable academic criteria and pedagogical considerations.

4. The effectiveness of the KuPin media in boosting the motivation of fifth-grade elementary school students

The results of the practicality test indicate that KuPin was rated as practical to highly practical for use in the context of IPAS learning at Sekolah Alam Amani and SDN Wadas I Karawang. In development research, practicality is a quality dimension that assesses whether a product is not only "good" in theory but can also be realistically applied in the classroom. Practicality encompasses ease of use, time efficiency, feasibility under varying facility conditions, and user acceptance—specifically by teachers and students. Therefore, the finding of high practicality indicates that KuPin has surpassed the criteria for conceptual feasibility and is beginning to meet the criteria for operational feasibility.

The practicality of the KuPin medium was determined by implementing the designed and developed medium with students through product testing (Rahayu & Sudarmin, 2015). The researcher conducted two product trials: a small-scale (limited) trial and a large-scale (extensive) trial. In the limited trial, the researcher tested the KuPin media with fifth-grade students at Sekolah Alam Amani and SDN Wadas 1 Karawang. Next, the researchers distributed response questionnaires to fifth-grade students and teachers at the two schools. To obtain feedback regarding the practicality of using the KuPin media, the researchers

employed two data collection techniques using two data sources. The techniques used were distributing practicality questionnaires to fifth-grade elementary school students who served as the pilot test sample and practicality questionnaires completed by fifth-grade teachers during IPAS lessons.

The KuPin (Smart Cat) media has proven to be practical to highly practical for science education in elementary schools. This operational feasibility is supported by a simple navigation system and an intuitive interface, making it easy for both teachers and students to operate smoothly under various school facility conditions. This practicality has received positive feedback for its ability to improve time efficiency and provide a realistic learning experience, rather than merely a theoretical one. Furthermore, KuPin's ease of use plays a strategic role in strengthening student communication. The easy-to-understand interface encourages students to respond more actively to the material, tackle challenges, and express their understanding without technical barriers. Thus, the practicality of the KuPin media successfully creates a participatory and communicative learning process, which supports the development of students' expressive abilities in a more meaningful way.

5. The Effectiveness of KuPin in Enhancing Elementary School Students' Motivation to Learn

The KuPin (Smart Cat) platform has proven effective in boosting student motivation through its engaging visual design and child-friendly interactive features. The use of bright colors, instant quizzes, and an automatic scoring system successfully captures students' attention and provides immediate feedback as a form of reward. Descriptively, student motivation falls into the "good" category, supported by the media's flexibility, which enables student-centered learning tailored to each student's pace – in line with the essence of the Merdeka Curriculum. Beyond motivation, KuPin's effectiveness also significantly strengthens communication. Interactive features encourage students to respond more actively, express their understanding, and interact dynamically with the media. In line with the principles of multimedia learning, KuPin has succeeded in creating an IPAS learning process that is more lively, participatory, and communicative compared to conventional methods.

Finally, indicators of enjoyment and satisfaction were achieved through the integration of an automated scoring system into KuPin. Observations revealed expressions of satisfaction among students when they successfully completed quizzes and received immediate positive feedback. This satisfaction serves as a form of reinforcement that not only boosts self-confidence but also ensures that learning motivation remains sustainable.

Overall, the results of this study confirm that the KuPin platform is effective in meeting Sudjana's motivational indicators. This platform successfully transforms students' motivational potential into measurable, self-directed, and enjoyable learning activities, which ultimately contribute positively to students' learning experiences at Sekolah Alam.

DISCUSSION

This section allows you to describe your research findings academically. You may not enter figures related to your statistical tests here; instead, you should explain those numbers here. You should structure your discussion with academic support for your studies and a good explanation according to the specific area you are investigating.

CONCLUSIONS AND RECOMMENDATIONS

Current elementary education is undergoing a significant shift with the introduction of the Integrated Natural and Social Sciences (IPAS) curriculum. However, in reality, many students still perceive IPAS as a heavy subject burdened by rote memorization and abstract concepts that are difficult to visualize. In conventional classrooms, teachers often remain the sole source of information, causing students to become passive, easily bored, and lacking the motivation to explore deeper.

To answer this challenge, a "bridge" is needed to connect the digital world of today's children with formal education. This led to the creation of KuPin, an interactive media application based on chatbot technology. KuPin is not just a typical app; it is designed as a virtual learning assistant featuring a friendly, intelligent, and responsive cat character that resonates with young learners.

The implementation of KuPin drastically changes the classroom atmosphere. Students' dormant curiosity is reawakened because they feel as if they are "playing" while learning. Motivation increases not through external pressure, but through genuine enjoyment and active engagement. Students are no longer afraid to make mistakes or ask "silly" questions, as KuPin provides a safe, judgment-free space for digital exploration.

Ultimately, IPAS learning is no longer about how much information a student can memorize, but about how much curiosity can be ignited. By integrating interactive media like KuPin, we are not just teaching science and social studies; we are preparing a generation that is digitally literate, creative, and possessed of a lifelong passion for learning.

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