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# PROFILE OF THE NEED FOR GAMIFICATION-BASED CHEMISTRY LEARNING MEDIA FOR MENTALLY RETARDED STUDENTS IN IMPROVING THE QUALITY OF LEARNING

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***Abstract***

*Mental retardation is a child who experiences obstacles in mental development or intelligence. This study aims to analysis the need for gamification-based chemistry learning media for mentally retarded students. The research method used is a qualitative survey method. The data collection process was carried out by distributing research questionnaires to 3 teachers and 12 students at the Sidoarjo Regency Inclusive Senior High School. The results showed that mentally retarded students needed gamification-based chemistry learning media. This is because gamification-based chemistry learning media has elements of images, videos, and games in it so that it can make mentally retarded students more active in the learning process, and can attract mentally retarded students' interest in studying chemistry at school.*

***Keywords:*** *Chemistry Learning Media, Gamification, Mentally Retarded Students*

## 1. INTRODUCTION

Children with special needs are those who possess unique characteristics and abilities that differ from those of other children. Children with special needs may experience difficulties or impairments, either since birth or due to accidents during their developmental years. These impairments or difficulties can be physical, mental, or social (Chamidah, 2013). According to data from the United Nations, children with special needs in the school-age population worldwide reach 10%. In Indonesia, the number of children with special needs attending Special Education Schools (SLB) reached 144,621 students during the 2020/2021 academic year. Among these, 82,326 children with special needs were enrolled in elementary school (SD), 36,884 in junior high school (SMP), and 25,411 in high school (SMA) (Darma & Rusyidi, 2015).

Children with special needs are children who experience physical, mental-intellectual, social, and emotional limitations during their growth and development. There are several terms used as variations of special needs such as disability, impairment, and handicap. Disability is a limitation to performing activities according to the rules, impairment is a child who experiences abnormalities in terms of psychological or anatomical structure and function, and handicap is a child who experiences

obstacles in fulfilling normal roles in individuals or can be said to be a mixture of disability and impairment (Desiningrum, 2016). Children with special needs have several types including (1) Tunagrahita, namely children who experience obstacles in mental development, (2) Learning Disabilities, namely children who have difficulty learning in terms of understanding or using spoken and written language, and these difficulties are seen in listening, thinking, reading, writing, and spelling, (3) Attention Deficit Hyperactivity Disorder namely mental disorders that cause children to have difficulty focusing attention, and have impulsive and hyperactive behavior, (4) Tunalaras namely children who experience obstacles in regulating emotions and adjusting to the surrounding environment, (5) Deaf-speaking children are children with hearing and communication impairments, (6) Visually impaired children are children with visual impairments, (7) Autism is a neurodevelopmental disorder that causes behavioral and social interaction disorders, (8) Physical impairment is a form of anomaly or defect in the muscle, bone, joint, and nervous systems caused by diseases, viruses, and accidents that occur before, during, or after birth, (9) Giftedness and Special Talents refer to children who possess potential or abilities above their peers in specific areas such as intellectual, academic, artistic, and leadership domains (Chamidah, 2013).

Children with special needs require special attention, particularly in the field of education. Based on the government's policy in Ministerial Regulation No. 70 of 2009 on inclusive education, inclusive education is a form of educational service where children with special needs can learn alongside their peers in regular schools located nearby. Inclusive education for children with special needs includes elementary school, junior high school, and high school. Inclusive schools can support children with special needs in obtaining the same education as their peers (Gusti, 2021).

A school that implements inclusive education accepts students with special needs. One type of student with special needs who can be accepted in such a school is a student with intellectual disability. During the learning process, only students with mild intellectual disabilities can be in the same class as regular students. This indicates that children with special needs can receive the same education and treatment as regular children. Moderate students are in special classes that have been provided because they require more specialized handling. Teachers in schools that implement inclusive education have special methods or ways of teaching because there are several students with certain limitations, particularly those with intellectual disabilities. According to Dedi Kustawan (2016), intellectual disability is a condition where an individual has below-average intelligence. He also stated that children suffering from intellectual disability will experience academic problems, leading to difficulties in understanding school materials (Sari et al., 2017). Chemistry lessons teach about the composition, structure, and properties of materials, as well as all changes that accompany reactions. Some schools only use visual learning media such as picture books, markers, and makeshift

props, making it challenging for teachers to teach students with intellectual disabilities, especially in abstract subjects like chemistry (Pradnyana et al., 2020). Additionally, students with intellectual disabilities can only concentrate for approximately 15 minutes. These issues make it increasingly difficult for teachers to convey chemistry materials that can be understood by students with intellectual disabilities (Pradnyana et al., 2020).

The challenges faced by children with intellectual disabilities can be addressed by using appropriate learning media that help maintain their concentration. One of the learning media that can be used is interactive learning media combined with game content. Gamification is a learning that uses games or video games and aims to attract students' attention in the learning process and make learning more fun (Jusuf, 2016). In gamification, several elements are present, including game thinking, game design, and game mechanics, which aim to enhance student motivation (Darnanta et al., 2020). Media learning based on games can make students more enthusiastic about learning and facilitate teachers in processing grades (Muchson et al., 2021). Media learning based on games can eliminate student boredom because the presence of a game makes the learning environment more enjoyable and relaxed (Rokhim et al., 2021). Therefore, teachers must be able to improve their competence in the field of technology, specifically in the creation of media learning based on ICT (Kurniawan et al., 2021). Media learning combined with games is a suitable solution for children with intellectual disabilities. This is because the concept of gamification makes learning more enjoyable and children with intellectual disabilities become more focused and able to maintain their concentration during the learning process in class. Media learning with the concept of gamification also trains the cognitive and motor skills of children with intellectual disabilities (Nurmanditya, 2021). Based on the above explanation, the researcher decided to conduct a study titled "Analysis of the Need for Chemistry Learning Media Based on Gamification for Students with Intellectual Disabilities." The purpose of this study is to analyze the need for chemistry learning media based on gamification for students with intellectual disabilities.

## METHODS

This research uses a qualitative survey method. According to Sugiyono, the survey research method is used to obtain data from a group of natural people (Rahayu, 2015). Questions or statements presented in a survey questionnaire typically relate to behavior, attitude, opinion, characteristics, expectations, classification, and knowledge. In the survey method, information is usually obtained from respondents who fill out questionnaires or surveys. Data from survey research from a sample of several people who represent a certain group of people. The survey research typically uses a sample from a specific group and employs questionnaires or surveys as data collection tools (Adiyanta, 2019).

The targets of this study were 12 students and 3 teachers at Sidoarjo Regency Inclusive High School. Researchers collected data using a teacher needs questionnaire and a student needs questionnaire. The teacher needs questionnaire will be given or circulated to teachers at school to analyze the needs of chemistry learning media at school. The questions in Chester's needs questionnaire for teachers can be seen in Table 1.

Table 1. Questions on Chester's Needs Questionnaire for Teachers

| No. | Question | Answer |
|---|---|---|
| 1. | Based on your views and observations during science (chemistry) learning, how do students react to the learning process in the classroom? | |
| 2. | What are the obstacles in learning chemistry for the mentally retarded? | |
| 3. | How is the learning strategy applied to chemistry learning for the mentally retarded? | |
| 4. | What are the learning materials/media that have been used in learning chemistry for the mentally retarded? | |
| 5. | What do you think if learning chemistry for students with mentally retarded interactive teaching materials are developed? | |
| 6. | In your opinion, can the development of interactive teaching materials in chemistry learning add insight and understanding of the concepts of students with intellectual disabilities? | |

In addition to containing questions that can be answered by teachers in the school, the teacher needs questionnaire also has several statements that need to be answered by teachers in the school by giving a mark (X) in the desired column. Some of these statements can be seen in Table 2.

Table 2. Statements on Chester's Needs Questionnaire for Teachers

| No. | STATEMENT | SS | S | N | TS | STS |
|---|---|---|---|---|---|---|
| 1. | Students with intellectual disabilities are allowed to learn science | | | | | |
| 2. | Students with intellectual disabilities are allowed to learn chemistry | | | | | |

| | | |
|---|---|---|
| 3. | Students with intellectual disabilities need interactive learning media | |
| 4. | Students with intellectual disabilities are more interested in things that are game-based | |
| 5. | The use of IT-based teaching materials or media and games for learning chemistry at school has been carried out effectively for students with intellectual disabilities. | |
| 6. | If one of the ways to integrate chemistry learning for students with disabilities is using technology and information based on gamification | |

The student needs questionnaire will be circulated to students at school to analyze the needs of chemistry learning media expected by students at school. The questions on Chester's needs questionnaire for students can be seen in Table 3.

Table 3. Questions on Chester's Needs Questionnaire for Students

| No. | Question | Answer |
|---|---|---|
| 1. | Based on the perspectives and observations during science (chemistry) lessons, how does the chemistry learning process proceed in the classroom? | |
| 2. | What are the challenges you face during the chemistry learning process? | |
| 3. | What strategies are implemented for the chemistry learning process? | |
| 4. | What learning materials/media have you used for the chemistry learning process? | |
| 5. | In your opinion, can the development of interactive teaching materials for chemistry learning increase knowledge and understanding of the subject matter? | |

In addition to containing questions that can be answered by students in the school, the student needs questionnaire also has several statements that need to be answered by students in the school by giving a mark (X) in the desired column. Some of these statements can be seen in Table 4.

Table 4. Statements on Chester's Needs Questionnaire for Students

| No. | STATEMENT | SS | S | N | TS | STS |
|---|---|---|---|---|---|---|
| 1. | You like science | | | | | |
| 2. | You can understand science and chemistry | | | | | |
| 3. | You are more interested in sound | | | | | |
| 4. | You are more interested in media with pictures | | | | | |
| 5. | You are interested in game activities | | | | | |
| 6. | You like the delivery of material with games | | | | | |
| 7. | You like to be accompanied by a companion/teacher | | | | | |
| 8. | You are easy to socialize | | | | | |
| 9. | You can imagine something that is not real | | | | | |
| 10. | You are interested in learning with technology and information | | | | | |

## RESULTS AND DISCUSSION

This research was conducted qualitatively using the survey method. The objective of the research was to analyze the need for chemistry learning media for students with intellectual disabilities. The data collection process involved distributing questionnaires to 12 students and 3 teachers at an inclusive high school that implements inclusive education. The teacher needs questionnaire was distributed to the teachers in the school to analyze the need for chemistry learning media in the school. The results of the answers to questions from the chemistry learning media needs analysis questionnaire for teachers are presented in Table 5.

Table 5. Results of Questionnaire Answers for Learning Media Needs Analysis for Teachers

| Question | Answer |
|---|---|
| 1. | 2 teachers stated that students with special needs struggle to learn chemistry and are still somewhat hindered<br>1 teacher noted that there are students who are interested in chemistry, as well as some who are passive in class |
| 2. | All teachers agreed that students with intellectual disabilities have below-average intelligence, which makes it difficult for them to understand chemistry concepts, and that teachers face challenges in teaching chemistry to these students |
| 3. | 1 teacher stated that the appropriate strategy for teaching chemistry to students with intellectual disabilities is to use games<br>1 teacher mentioned that a suitable strategy is to approach the students personally |

| | |
|---|---|
| | 1 teacher stated that the appropriate strategy is to explain the material repeatedly until the students with intellectual disabilities can understand the chemistry material |
| 4. | 1 teacher stated that the typical learning materials used for teaching chemistry to students with intellectual disabilities are printed materials and videos<br>1 teacher noted that there are no specific learning materials currently used for these students<br>1 teacher stated that the typical learning materials used for teaching chemistry to students with intellectual disabilities are examples of practical applications in everyday life |
| 5. | All teachers agreed that interactive learning materials are beneficial for students with intellectual disabilities. |
| 6. | All teachers agreed that interactive learning materials for chemistry can enhance the knowledge and understanding of chemistry concepts among students with intellectual disabilities. |

Table 5 indicates that the teachers teaching students with intellectual disabilities at an inclusive high school require an interactive learning medium to assist in the chemistry learning process for these students. Interactive learning media are needed to engage and help students with intellectual disabilities understand chemistry material effectively. Based on the research conducted by Herdiyanto, Sulton, and Praherdhiono (2020), interactive learning media can be used by students with intellectual disabilities. This is evidenced by the increased scores after using interactive learning media (Herdiyanto et al., 2020).

In addition to these questions, the questionnaire for analyzing the needs of chemistry learning media for teachers also has statements that can be selected. The results of the answers to the statements from the chemistry learning media needs analysis questionnaire for teachers are presented in Figure 1.

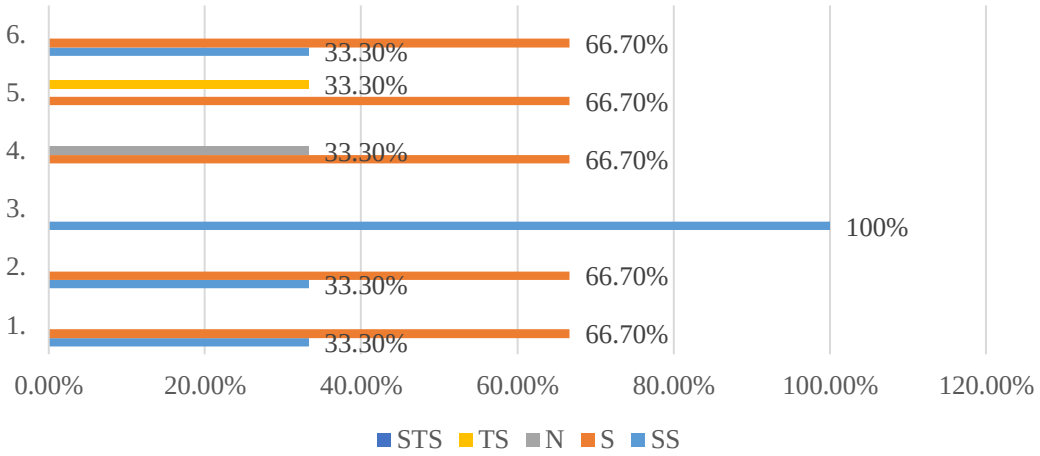


Figure 1. Percentage of Chemistry Learning Media Needs Analysis Questionnaire for Teachers

Figure 1 shows that students with intellectual disabilities have received science education, especially chemistry education, at school  In the learning process, interactive learning media is required. One such interactive learning medium is a game-based learning media. This is because students with intellectual disabilities enjoy playing games. Teachers agree to use game-based IT learning media because these media can attract the interest of students with intellectual disabilities, making them more active and attentive to the lesson. According to the research by Saputra and Febriyanto (2019), IT-based learning media can attract the interest of students with intellectual disabilities, making them more active and attentive to the lesson (Saputra & Febriyanto, 2019).

The statements numbered 1 and 2 aim to determine the involvement of students with intellectual disabilities in science learning, especially chemistry. All teachers stated that students with intellectual disabilities receive science education, especially chemistry, at school. According to Gusti (2021), students with intellectual disabilities are expected to have the same opportunities as regular children, thereby enabling them to receive the same education as other children. Therefore, when regular children receive science education, especially chemistry, students with intellectual disabilities also receive the same education (Gusti, 2021).

The statements numbered 3 and 4 aim to determine the interest of students with intellectual disabilities in interactive learning media, particularly game-based learning media. All teachers stated that students with intellectual disabilities enjoy playing games, which can make them listen to lessons better, attract their interest in learning school materials, and maintain their concentration during learning. Based on the research conducted by Mawanti and Cholily (2021), game-based learning media can enhance the motor skills of students with intellectual disabilities, increase their learning

motivation, build their self-confidence with a high sense of curiosity, and provide positive psychological effects for students with intellectual disabilities (Mawanti & Cholily, 2021).

Statements numbered 5 and 6 aim to determine the use of IT-based game learning media in chemistry education at school. Most teachers agree with the use of IT-based learning media and have already started using them in chemistry education for students with intellectual disabilities. IT-based learning media are more effective and efficient in their use. The IT-based game learning media, which include elements such as images, videos, and games, are more engaging and enjoyable for use in chemistry education for students with intellectual disabilities. According to the research by Sari and Maharani (2020), the role of game-based learning media is to visualize molecular aspects in chemistry topics. With the presence of visual displays, students become more understanding of chemistry concepts and can increase their learning interest (R. N. Sari & Maharani, 2020).

The student needs questionnaire will be circulated to students at school to analyze the needs of chemistry learning media expected by students at school. The data collection process was carried out by distributing questionnaires to 12 students. The results of the answers to questions from the chemistry learning media needs analysis questionnaire for students are presented in Table 7.

Table 7. Results of Questionnaire Answers for Learning Media Needs Analysis for Students

| Question | Answer |
|---|---|
| 1. | 9 students stated that chemistry lessons were enjoyable because the teacher used PowerPoint and there was good interaction between the chemistry teacher and the students<br>2 students stated that chemistry lessons were difficult to understand<br>1 student stated that chemistry lessons were just average |
| 2. | 6 students stated that the chemistry material was too theoretical, causing difficulties in memorizing and understanding the material, particularly in memorizing and applying chemical formulas<br>4 students stated that the teacher explained the chemistry material too quickly, making it difficult for the students to understand<br>2 students stated that the difficulty in chemistry learning stemmed from the blurry or glare-prone images and text on the PowerPoint, which were affected by sunlight from outside, making them hard to read |
| 3. | 8 students stated that the chemistry learning strategy at school often uses PowerPoint, games, or books to learn and practice chemistry problems |

| | |
|---|---|
| | 2 students stated that the chemistry learning strategy at school is still centered on the teacher and only involves listening to the teacher's explanations<br>1 student stated that the chemistry learning strategy at school uses a discussion method, resulting in an interaction between the teacher and students, and students better understand the chemistry material<br>1 student stated that the chemistry learning strategy at school involves learning basic material that has not been discussed and writing additional notes from the teacher |
| 4. | 7 students stated that the typical chemistry teaching materials used at school are PowerPoint<br>4 students stated that the typical chemistry teaching materials used at school are books, student worksheets, YouTube, and Zenius<br>1 student stated that the teaching materials used are audio media |
| 5. | All students agree that interactive teaching materials in chemistry learning can add insight and understanding of material concepts. |

Table 7 shows that chemistry learning is considered enjoyable when there is interaction between students and teachers and when teaching materials are used. One of the commonly used teaching materials at school is PowerPoint. However, some students also find chemistry learning to be difficult to understand due to the abundance of theories and formulas that need to be memorized, as well as the teacher's tendency to explain quickly and often using a lecturing method. This can certainly lower the students' interest in learning chemistry. According to the research by Ristiyani and Bahriah (2016), teachers are the highest indicator affecting students' learning difficulties. Teachers who teach monotonously and do not use appropriate learning media can be one of the reasons why students struggle to learn chemistry material (Ristiyani & Bahriah, 2016). Therefore, interactive learning media are highly needed for students. One such interactive learning medium is IT-based game learning media. IT-based game learning media can attract students' interest in understanding chemistry material. Based on the research by Muhibullah and Zamhari (2021), IT-based learning media can attract students' interest, thereby increasing their learning outcomes (Muhibullah & Zamhari, 2022).

In addition to these questions, the questionnaire for analyzing the needs of chemistry learning media for students also has statements that can be selected. The results of the answers to the statements from the chemistry learning media needs analysis questionnaire for students are presented in Figure 2.

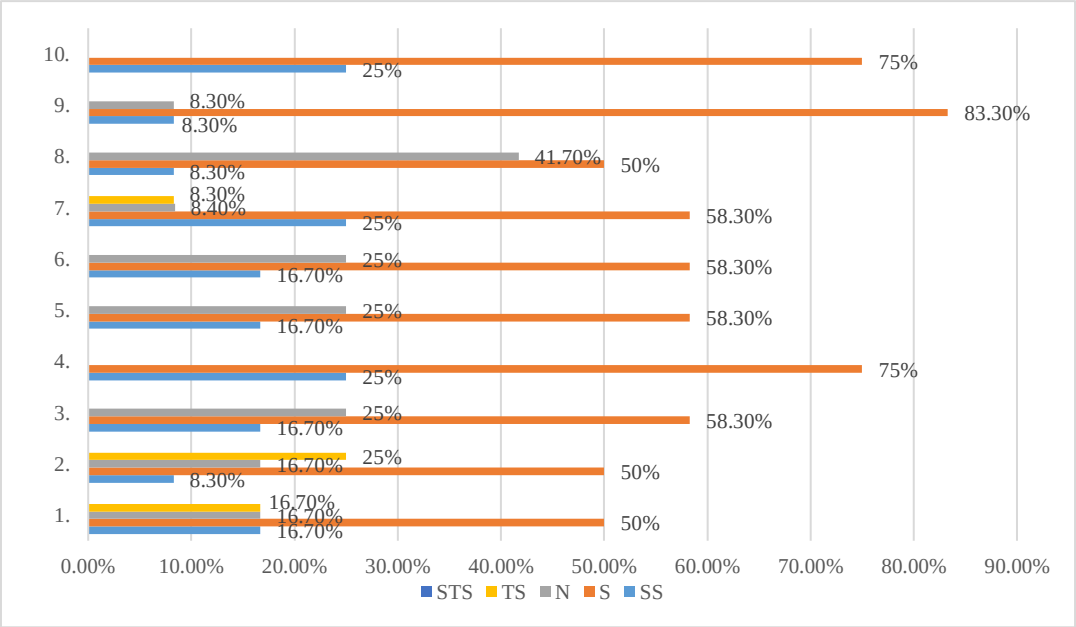


Figure 2. Percentage of Chemistry Learning Media Needs Analysis Questionnaire for Students

Based on Figure 2, statements 1 and 2 aim to determine the interest and understanding of students towards the science subject, particularly chemistry. The majority of students stated that they are interested in and understand the science subject, particularly chemistry. However, some students do not agree with this. According to the book written by Sunyono (2015), students tend to memorize a material verbally but do not fully comprehend the scientific concepts. In this case, students can achieve good grades during exams by memorizing theories or formulas verbally, but they do not fully understand science (Sunyono, 2015).

The statements numbered 3 and 4 aim to determine students' interest in multimedia learning materials that include sound and image elements. The majority of students showed interest in multimedia learning materials with sound and image elements. This is because such materials can make chemistry materials more engaging and easier to understand. According to Nurrita's research (2018), multimedia learning materials with sound, images, and videos can capture students' attention, thereby enhancing their learning motivation (Teni Nurrita, 2018).

The statements numbered 5 and 6 aim to determine students' interest in game-based learning media during the delivery of material. The majority of students showed interest in game-based learning media. This is because game-based learning media can make the learning process more relaxed and less rushed, allowing students to easily understand the material. Based on Sapriyah's research (2019), game-based learning media can make learning more engaging and enjoyable, thus enabling students to receive the learning content well and comfortably (Sapriyah, 2019).

The statements numbered 7, 8, and 9 aim to determine students' behavior in school. The majority of students prefer to learn while being accompanied by a teacher and are students who are easy to socialize with. Additionally, these students are imaginative, which is a positive trait because chemistry materials are abstract and require imaginative thinking to visualize them. Based on Sunyono's book (2015), there are many abstract and theoretical scientific theories. These abstract topics are necessary to understand scientific phenomena qualitatively and quantitatively. Understanding these abstract topics is left to the students to comprehend through images or diagrams in books or on the internet without the guidance or instruction of a teacher, thereby enabling students to imagine the scientific processes or phenomena occurring (Sunyono, 2015).

Statement number 10 aims to determine students' interest in technology. All students expressed their interest in the advancements in technology, particularly in multimedia learning materials based on IT or games. This indicates the need for an IT-based game-learning media to further enhance students' enthusiasm for learning chemistry. According to the research conducted by Sari, Saputro, and Hastuti (2014), students become more enthusiastic when using IT-based multimedia learning materials during the learning process (K. W. Sari, S. Saputro, 2014).

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Based on the survey conducted among teachers and students at Sidoarjo Regency Inclusive High Schools, students with intellectual disabilities require a learning medium that can be used in the learning process of chemistry materials at school. The learning medium that can be used by students with intellectual disabilities is a chemistry-based gamification learning medium. This learning medium can capture the interest of students with intellectual disabilities, thereby increasing their concentration during the chemistry learning process. Additionally, the chemistry-based gamification learning medium can make the learning environment more relaxed and enjoyable. This makes students more enthusiastic about learning chemistry. Furthermore, the chemistry-based gamification learning medium also trains the cognitive and motor skills of children with intellectual disabilities.

### Recommendations

Researchers hope that teachers or educators will enhance their IT competencies so that teachers can create an IT-based learning medium. This is because an IT-based learning medium can make the learning process more relaxed and enjoyable, thereby making students more active and maintaining their enthusiasm for the learning process.

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