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CHEM-KAHOOT INTERACTIVE GAMIFICATION TO REALISE JOYFUL AND CHARACTERFUL CHEMISTRY LEARNING

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ABSTRAK

Untuk meningkatkan motivasi, keterlibatan, dan pengembangan karakter siswa, penelitian ini melihat penggunaan Chem-Kahoot sebagai alat gamifikasi dalam pembelajaran kimia yang menyenangkan. Mengevaluasi kemampuan Chem-Kahoot dalam meningkatkan pemahaman siswa terhadap prinsip-prinsip ikatan kimia sekaligus mempromosikan nilai-nilai dasar yang sesuai dengan Profil Siswa Pancasila adalah tujuan utamanya. Observasi kelas, penggunaan Kahoot di kelas kimia, dan pengiriman kuesioner kepada 130 siswa yang dipilih secara acak di kelas X, XI, dan XII di SMAN 1 Sindue Tobata adalah bagian dari metodologi penelitian berbasis survei. Skala Likert (1-5) digunakan untuk memeriksa data, dan SPSS digunakan untuk validasi statistik. Temuan menunjukkan bahwa Chem-Kahoot secara signifikan meningkatkan pengalaman belajar, dengan peringkat tertinggi untuk kesenangan (92%), keterlibatan (90%), dan motivasi (86%). Selain itu, siswa menunjukkan peningkatan kreativitas (90%), pemikiran kritis (86%), dan kerja sama (88%). Studi ini menyoroti bahwa gamifikasi secara efektif mengurangi kebosanan dan kecemasan sambil mendorong pembelajaran mandiri. Singkatnya, Chem-Kahoot adalah metode yang efektif untuk mengajarkan kimia dengan cara yang menyenangkan yang meningkatkan interaksi dan signifikansi. Untuk memaksimalkan pembelajaran yang berpusat pada siswa, lebih banyak teknik gamifikasi harus diselidiki dalam penelitian di masa depan.

ABSTRACT

To enhance student motivation, engagement, and character development, this study examines the application of Chem-Kahoot as a gamification tool in happy chemistry learning. Evaluating Chem-Kahoot's ability to enhance students' comprehension of chemical bonding principles while promoting fundamental values consistent with the Pancasila Student Profile is the primary goal. Classroom observations, the use of Kahoot in chemistry classes, and the delivery of questionnaires to 130 randomly chosen students in grades X, XI, and XII at SMAN 1 Sindue Tobata were all part of the survey-based study methodology. A Likert scale (1–5) was used to examine the data, and SPSS was used for statistical validation. The findings indicate that Chem-Kahoot significantly enhances learning experiences, with the highest ratings for enjoyment (92%), engagement (90%), and motivation (86%). Additionally, students exhibited increased creativity (90%), critical thinking (86%), and cooperation (88%). The study highlights that gamification effectively reduces boredom and anxiety while fostering independent learning. To sum up, Chem-Kahoot is an effective method for teaching chemistry in a fun and engaging way that enhances interaction and understanding. To maximize student-centered learning, further investigation into gamification techniques is warranted in future studies.

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INTRODUCTION

To increase student enthusiasm and comprehension, 21st-century learning necessitates innovative teaching strategies. (Sumardi, Rohman, and Wahyudiati 2020). Globally, encouraging active learner participation is a problem for traditional methodologies, which are still widely used in many nations. Gamification is being utilized in various areas of education to make learning more dynamic and engaging as technology continues to advance (Ahmar et al. 2023). It has been demonstrated that gamification increases student engagement and fosters their competitive spirit and enthusiasm for learning.

There are still many barriers to gamification in Indonesian education, particularly in science subjects such as chemistry, which students often find challenging and abstract. (Saleem, Noori, and Ozdamli 2022) . Students are less interested in studying chemistry when it is taught in a theoretical, rote-oriented manner. (Azzajjad, Ahmar, and Syahrir 2020; Sri Wulan, Redhana, and Adnyana 2020). Thus, more creative teaching strategies are required to ensure that students not only fully comprehend the material but also get engaged with it.

Similar difficulties are also observed at SMAN 1 Sindue Tobata. Many students struggle to grasp chemistry concepts, particularly when it comes to abstract topics such as thermochemistry, redox processes, and chemical bonding. Low motivation and poor learning outcomes are often attributed to unengaging teaching strategies and a lack of student engagement in the educational process. To increase pupils' enthusiasm for learning, a more engaging and entertaining approach is needed.

One of the creative strategies that may be applied to solve this issue is gamification. (Ghofur et al. 2023; Marougkas et al. 2021; Tan and Cheah 2021). To boost student motivation and engagement, gamification in education incorporates game aspects like points, challenges, and rewards (Aldalur and Perez 2023; Jariyah, Wahyudiati, and Amelia Riyandari 2022; Lorello and Lippi 2023). Kahoot is among the most well-liked and successful gamification tools for education. (Balaskas et al. 2023; Tao and Zou 2023; Wang and Tahir 2020). With the help of Kahoot, educators can make interactive tests that students may take at any time, fostering a lively and competitive learning environment. Through more dynamic and challenge-based interactions, Kahoot can enhance students' understanding of chemistry concepts.

Joyful learning in chemistry is essential for students' emotional, psychomotor, and cognitive development (Janah and Mitarlis 2024; Musbhirah et al. 2018; Yuyun., Tiring, and Nirmalasari 2021). Students who study with joy are less likely to be anxious about challenging chemical materials and are more inclined to pursue further studies. Students are more likely to think critically, participate fully, and feel more assured about their comprehension of chemical ideas in an upbeat and enthusiastic environment.

Incorporating gamification into chemistry education contributes to students' character development in addition to increasing motivation and comprehension (Wan 2023). Students' Worksheets (LKPD) that are gamified are a great way to foster qualities like curiosity, teamwork, honesty, responsibility, and sportsmanship. Honesty fosters strong academic attitudes, accountability educates students to take problems seriously, sportsmanship teaches them to accept results with a positive attitude, curiosity motivates students to seek solutions actively, and cooperation facilitates peer collaboration. Students can benefit from these characteristics not just in the classroom but also in their future social and professional lives.

The purpose of this study is to investigate how well Chem-Kahoot works as a gamification technique for fun chemistry instruction combined with character

development. As a result, it is anticipated that this research will help create chemistry education that is more engaging, challenging, and meaningful for children, while also providing them with valuable life skills that they can utilize in the future.

METHODS

To gather empirical evidence on the efficacy of Kahoot-based gamification in happy chemistry learning, as well as its impact on student motivation and character education reinforcement, this study employed a survey technique. The research team observed the courses that made up the research sample. The purpose of this observation is to learn more about the previous chemical learning pattern, student participation in the process, and the degree to which the instructor has used the happy learning strategy.

Following the first observation, the study team gamified chemistry education by introducing Kahoot. This introduction was completed in several steps: 1) Socialization of Teachers, Teachers received instruction on how to use Kahoot in the classroom, 2) Use of Kahoot Demonstration, Through both individual tests and group competitions, students were encouraged to give Kahoot a try, 3) Kahoot-Based Learning, After presenting the chemistry content to the students in a traditional manner, they participated in an interactive test that used Kahoot as a means of assessment and reinforcement of their knowledge of the subject. Following the Kahoot learning session, the study team administered questionnaires to the students who had participated in the activity. The survey was created to gauge several factors, including 4) Student perceptions of gamification (Kahoot), the degree to which students comprehend the idea of gamification, and how it may be used in education.

Views of students about gamification in the study of chemistry, Views of students about the advantages and efficacy of gamification in enhancing their comprehension of chemistry-related content. The degree to which students love using Kahoot to learn, and how much more eager kids are to study chemistry when they use Kahoot instead of traditional techniques. Positive learning results following Kahoot use suggest that using Kahoot effectively boosts students' motivation and makes studying more enjoyable.

Table 1. Distribution of respondent data

Respondent information	Number of Students
Age (Years)	
15	40
16	45
17	45
Domicile	
< 1 Km from school	25
1-3 Km from school	40
4-6 Km from school	35
> 6 Km from school	30
Parents' Occupation	
Civil Servants	20
Farmers	40
Fisherman	30
Self-employed	25
Orphan	15

The students at SMAN 1 Sindue Tobata comprised the study population, and 130 students from classes X, XI, and XII were randomly selected to form the research sample. To ensure that the data collected represented the representative state of the population, a random sample selection procedure was employed. A questionnaire of 23 statements, eight indicators, and five primary elements served as the research tool. The purpose of the tool was to gauge students' feelings about using Kahoot to study chemistry and how it impacted their motivation to learn and their enjoyment of the subject. Three primary

techniques were employed to gather data: classroom observation, the use of Kahoot in chemistry education, and distributing questionnaires to students after class activities. To ensure authenticity and accuracy, data were collected systematically. A 5-point Likert scale was used to analyze the data.

The Pearson Product-Moment correlation between each item and the overall score was used to perform the validity test. If the correlation value (r-count) is higher than the r-table (for instance, at N=130 with α=0.05, r-table ≈ 0.171), the validity findings are deemed valid.

Table 2. Validity Test Results

item number	r-count	r-table (0.171)	Description	Item number	r-count	r-table (0.171)	Description
Q1	0,652	0,171	Valid	Q13	0,695	0,171	Valid
Q2	0,714	0,171	Valid	Q14	0,719	0,171	Valid
Q3	0,689	0,171	Valid	Q15	0,735	0,171	Valid
Q4	0,702	0,171	Valid	Q16	0,708	0,171	Valid
Q5	0,676	0,171	Valid	Q17	0,677	0,171	Valid
Q6	0,715	0,171	Valid	Q18	0,725	0,171	Valid
Q7	0,723	0,171	Valid	Q19	0,730	0,171	Valid
Q8	0,678	0,171	Valid	Q20	0,698	0,171	Valid
Q9	0,682	0,171	Valid	Q21	0,729	0,171	Valid
Q10	0,699	0,171	Valid	Q22	0,703	0,171	Valid
Q11	0,701	0,171	Valid	Q23	0,740	0,171	Valid
Q12	0,731	0,171	Valid				

The Cronbach's Alpha coefficient is used to assess reliability. If the Cronbach's Alpha value is more than 0.70, the instrument is considered reliable. Cronbach's Alpha for the reliability test results (SPSS Output-Reliability Statistics) was 0.896, with a total of 23 statement items. Because Cronbach's Alpha is 0.896, the reliability of the data in this category is relatively high.

RESULT AND DISCUSSION

Interpretation of Chem-Kahoot Implementation

Chem-Kahoot, as a gamification tool in Chemistry learning, has been utilized in this study to assess its efficacy on students' learning experience. The data acquired from the questionnaire responses reveal how students judge the implementation of Chem-Kahoot based on 23 statements spanning factors of engagement, motivation, content knowledge, and joyful learning experience. A total of 130 respondents' data was processed using 23 statements, categorized into four primary areas, to analyze how well Chem-Kahoot facilitates joyful learning of chemistry. A table presenting the average score for each component is provided.

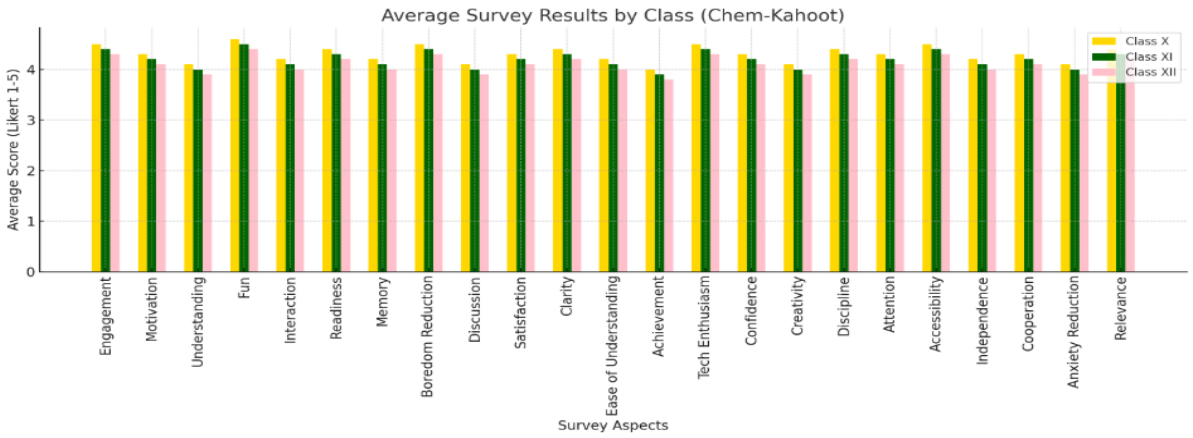

Figure 1. Interpretation of Chem-Kahoot implementation questionnaire results

Table 3. Results of questionnaire data distribution: Chem-Kahoot Implementation

No.	Aspect dan statement	mean	Classification
	Effectiveness and learning experience		
1	Engagement in learning	4.5	Very High (4.21-5.00)
2	Increased learning motivation	4.3	Very High (4.21-5.00)
3	Understanding of chemical bonding concepts	4.1	High (3.41-4.20)
4	Fun in learning	4.6	Very High (4.21-5.00)
5	Interaction with friends and teacher	4.2	High (3.41-4.20)
6	Readiness for evaluation	4.4	Very High (4.21-5.00)
Average		**4.35**	Very High (4.21-5.00)
	Effectiveness of learning and student learning experience		
1	Improving memory of chemical concepts	4.2	High (3.41-4.20)
2	Boredom reduction	4.5	Very High (4.21-5.00)
3	Activeness in discussion	4.1	High (3.41-4.20)
4	Satisfaction in learning chemistry	4.3	Very High (4.21-5.00)
5	Clarity of material with Kahoot	4.4	Very High (4.21-5.00)
Average		**4.3**	Very High (4.21-5.00)
	Effectiveness of gamification-based learning and student learning experience,		
1	Ease of understanding concepts with gamification	4.2	High (3.41-4.20)
2	Effect on academic achievement	4.0	High (3.41-4.20)
3	Enthusiasm for technology-based learning	4.5	Very High (4.21-5.00)
4	Confidence in answering questions	4.3	Very High (4.21-5.00)
5	Influence on creativity	4.1	High (3.41-4.20)
Average		**4.22**	**Very High (4.21-5.00)**
	Real Life Context and Application		
1	Discipline in learning	4.4	Very High (4.21-5.00)
2	Attracts attention in learning	4.3	Very High (4.21-5.00)
3	Easy to access and use	4.5	Very High (4.21-5.00)
4	Motivates students to learn independently	4.2	High (3.41-4.20)
5	Improves co-operation with friends	4.3	Very High (4.21-5.00)
6	Reduces anxiety in learning	4.1	High (3.41-4.20)
7	Relevance to everyday life	4.4	Very High (4.21-5.00)
Average		**4.31**	**Very High (4.21-5.00)**
Total		**4.29**	**Very High (4.21-5.00)**

The results of this study highlight how Chem-Kahoot significantly improves student enthusiasm, engagement, and understanding of chemical bonding principles. The fact that the "Fun in Learning" component received the highest grade (4.6) indicates that gamification of chemistry training produces an engaging and entertaining learning environment. The gamification hypothesis, which posits that game-based components, such as competition, prizes, and interactivity, can enhance intrinsic motivation and foster a positive attitude toward learning, is consistent with this finding.

Additionally, as indicated by the 4.2 score, the survey reveals a significant relationship between students and professors, as well as between students and their classmates. This suggests that gamified learning settings promote teamwork, a key aspect of active learning. After using Chem-Kahoot, students appear to have more confidence in their abilities to present their knowledge, as indicated by their preparedness for evaluation score of 4.4. This finding aligns with other studies that demonstrate how gamification, which enables students to take low-stakes formative tests before official evaluations, can reduce exam anxiety and promote self-evaluation.

Another critical aspect of the research, the efficacy of learning, was also rated well, especially in terms of reducing boredom (4.5) and increasing learning satisfaction (4.3). The decrease in ennui is a significant result, as the abstract nature of chemistry and the challenge of

picturing molecular interactions are frequently cited as reasons for students' disinterest in the subject. The fact that Chem-Kahoot overcomes this difficulty suggests that gamification may be an effective teaching strategy for maintaining students' attention.

Furthermore, the 4.2 rating for ease of grasping chemical ideas highlights the cognitive advantages of gamified and interactive learning strategies. Iterative learning procedures, visual reinforcements, and immediate feedback are gamification techniques that help break down complex subjects into more manageable and digestible chunks. A score of 4.5, which indicates a strong interest in technology-based learning, supports the notion that students are more open to learning materials when they are presented in a way that suits their technological preferences.

When combined, these results provide credence to the larger educational discussion on how gamification may revolutionize science instruction. Teachers may increase student engagement, maintain motivation, and advance conceptual knowledge by incorporating digital resources into their lesson plans (Setemen, Sudirtha, and Widiana 2023). These findings are also consistent with current ideas of active learning and educational technology, which emphasize the value of dynamic and engaging teaching methods in creating profound and meaningful learning experiences.

Distribution of Character Achievements After Learning with Gamification (Chem-Kahoot)

This study also examines the impact of Chem-Kahoot on character development, aligned with the Pancasila Student Profile (Profil Pelajar Pancasila). The character attributes assessed include Faith and Morality, Critical Thinking, Creativity, Independence, and Cooperation.

Table 4. Character Development Assessment

Character Aspect	Mean Score	Percentage (%)	Classification
Faith and Morality	4.2	84%	High
Critical Thinking	4.3	86%	Very High
Creativity	4.5	90%	Very High
Independence	4.1	82%	High
Cooperation	4.4	88%	Very High

The results of this study demonstrate how Chem-Kahoot significantly influences several facets of students' cognitive and emotional growth when learning chemistry. With a high mean score of 4.3 (86%), the findings indicate that Chem-Kahoot is crucial for developing critical thinking skills. This indicates that rather than depending only on rote memory, the platform encourages students to assess, evaluate, and apply their information while also successfully involving them in problem-solving and conceptual comprehension. Students' higher-order thinking abilities are improved by encouraging them to support their arguments, link ideas logically, and hone their problem-solving techniques through interactive questions and real-time feedback (Akour and Alenezi 2022; Dabbagh, Fake, and Zhang 2019).

The attribute with the highest rating (4.5, 90%) among those evaluated was creativity, highlighting the potential of gamification to encourage creative thinking and investigation in the study of chemistry. Chem-Kahoot's dynamic and interactive features help students to think creatively, try out various solutions, and approach issues from several angles. Through the incorporation of game-based components, such as timers, point systems, and various question formats, Chem-Kahoot fosters an atmosphere that encourages students to think creatively and devise unique solutions to problems, ultimately resulting in a more engaging educational experience.

Additionally, the study shows that collaboration was another highly valued feature (4.4, 88%), suggesting that Chem-Kahoot greatly encourages peer relationships and teamwork. Because students often participate in debates, share ideas, and collaborate to find answers, the platform fosters collaborative learning (Boice et al., 2021; Ubaidullah et al.,

2021). In addition to improving academic achievement, this joint involvement fosters critical interpersonal skills, including negotiation, communication, and conflict resolution. The platform's gamified design encourages community and group learning, which is particularly beneficial in courses like chemistry, where group problem-solving is often required.

With a grade of 4.2 (84%), Chem-Kahoot's contribution to promoting morality and religion is another significant conclusion. The findings imply that students' moral and character development is aided by the courteous and moral rivalry that game-based learning promotes. Students learn to appreciate their friends, be good sports, and maintain integrity in the classroom by participating in Kahoot exercises. Healthy rivalry is fostered by organized yet entertaining competition, which strengthens virtues such as tenacity, equity, and tolerance for differing viewpoints, all of which are essential in both academic and professional settings.

According to the study, Chem-Kahoot encourages self-directed learning, as seen by its 4.1 (82%) independence rating. This implies that self-paced interaction with chemical information empowers students to take charge of their education. Nonetheless, the marginally lower score in other qualities suggests that developing independent problem-solving abilities may require some effort. More individualized learning routes, adaptive challenges, and open-ended problem-solving activities might be added to the platform to promote independence further (Azzajjad, Tendrita, and Ahmar 2021). Students would gain confidence in their analytical skills, be able to study chemical subjects at their own pace, and feel more accountable for their academic achievements with such changes.

Our results support Chem-Kahoot's efficacy as a gamified learning resource that improves students' cognitive and affective learning. The platform is a valuable tool in contemporary chemistry education, as it fosters individual learning, critical thinking, creativity, teamwork, and ethical principles. Chem-Kahoot can further enhance student engagement and academic achievement in the discipline of chemistry by improving certain features, particularly in promoting higher autonomous learning and complex problem-solving**.**

CONCLUSION

According to the research findings, Chem-Kahoot significantly enhances students' chemistry learning experiences, particularly in the area of chemical bonding. It has been demonstrated that incorporating gamification through Kahoot improves motivation, engagement, and understanding, making chemistry more engaging and participatory. According to the results, students thought the learning process was very successful, particularly in terms of enjoyment, motivation, and preparation for evaluation. Additionally, Chem-Kahoot's use greatly aids in the development of important student character attributes that align with the Pancasila Student Profile. Creativity and teamwork showed the most significant gains, followed by independence, religion and morals, and critical thinking. This implies that game-based learning can promote critical 21st-century values and abilities in addition to academic development. It is recommended that Chem-Kahoot be consistently incorporated into chemistry classes as a means of enhancing engaging and meaningful learning, given these favorable results. To further enhance learning efficacy and student engagement, future studies can investigate additional gamification technologies and their impact on various chemical topics.

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