
Digital Literacy and Intrinsic Motivation in Chemistry Learning: A Case Study of High-Achieving Students

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Abstract

This study examines the impact of digital literacy and intrinsic motivation on students' academic success, particularly in chemistry at SMA Negeri 1 Kerinci. Employing a descriptive qualitative approach with a case study design, the research focused on 10 high-achieving students from the National Science Competition (KSN). Data were gathered through observations and in-depth interviews, then analyzed using Miles and Huberman's qualitative analysis method, which involves data reduction, data display, and conclusion drawing. The findings reveal that students with strong digital literacy skills are adept at locating, utilizing, selecting, evaluating, and applying digital information to enhance their learning. These students actively seek information from reliable sources, verify its accuracy, and produce original work. High intrinsic motivation is reflected in their dedicated study habits, persistence, and thorough exam preparation. To maintain motivation, students employ strategies such as effective time management and collaboration with peers. The synergy between strong digital literacy and high intrinsic motivation significantly boosts academic achievement. Thus, fostering both digital literacy and intrinsic motivation is essential in education, especially in science.

Keywords: chemistry learning; digital literacy; intrinsic motivation

Abstrak

Penelitian ini mengkaji dampak literasi digital dan motivasi intrinsik terhadap keberhasilan akademik siswa, khususnya pada mata pelajaran kimia di SMA Negeri 1 Kerinci. Dengan menggunakan pendekatan kualitatif deskriptif dan desain studi kasus, penelitian ini berfokus pada 10 siswa berprestasi yang merupakan peserta Kompetisi Sains Nasional (KSN). Data dikumpulkan melalui observasi dan wawancara mendalam, kemudian dianalisis menggunakan metode analisis kualitatif Miles dan Huberman, yang mencakup tahapan reduksi data, penyajian data, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa siswa dengan kemampuan literasi digital yang kuat memiliki kecakapan dalam menemukan, memanfaatkan, menyeleksi, mengevaluasi, dan menerapkan informasi digital untuk menunjang pembelajaran mereka. Para siswa ini secara aktif mencari informasi dari sumber tepercaya, memverifikasi akurasi, serta menghasilkan karya orisinal. Motivasi intrinsik yang tinggi tercermin dalam kebiasaan belajar yang penuh dedikasi, kegigihan, dan persiapan ujian yang matang. Untuk menjaga motivasi, siswa menerapkan strategi seperti manajemen waktu yang efektif dan kolaborasi dengan rekan sejawat. Sinergi antara literasi digital yang kuat dan motivasi intrinsik yang tinggi secara signifikan meningkatkan prestasi akademik. Dengan demikian, pengembangan literasi digital maupun motivasi intrinsik merupakan hal yang esensial dalam dunia pendidikan, khususnya di bidang sains.

Keywords: literasi digital; motivasi instrinsik; pembelajaran kimia

Introduction

Advancements in technology have greatly impacted the education sector. The introduction of the internet and digital devices has expanded students' access to a wide range of learning resources and enabled them to engage with teachers and peers across different locations. The integration of technology in education, particularly in chemistry, enhances students' comprehension of complex concepts. Previous studies suggest that digital literacy encompasses the skills to identify and acquire accurate information, critically analyze it, and utilize this knowledge for both personal and collaborative growth (Hardika & Isroah, 2022).

Digital-based learning has also proven effective in improving students' learning outcomes. For example, a study reported a 52.8% increase in learning outcomes through strategies involving planning, implementation, and reflection in digital learning (Wijayati et al., 2019). Digital literacy, which includes skills in operating digital devices and leveraging intellectual capacity to acquire, analyze, synthesize, and use quality information, has become increasingly important in today's educational context. It also plays a role in enhancing online communication and collaboration skills between teachers and students, as well as self-regulation, which is crucial for preventing the spread of inaccurate information or hoaxes (Yusuf et al., 2022).

In the context of chemistry education, mastering digital literacy can help students in selecting, processing, and interpreting information available on the internet more effectively (Patmanthara & Hidayat, 2018). These skills enable students to communicate and work more effectively in both academic contexts and future career preparation. Digital technology has also positively contributed to the development of Android-based chemistry learning media, which has been highly rated by teachers and students (Kajin, 2018). Additionally, developing digital modules with short stories can address the lack of understanding of

chemistry material caused by suboptimal technology application.

Learning motivation is also a crucial factor affecting student outcomes. Intrinsic motivation, which comes from within the individual without external pressure, can enhance the learning outcomes of high-achieving students (Dewi et al., 2024; Eriany et al., 2013). The combination of good digital literacy and intrinsic motivation is believed to significantly improve students' academic performance (Tristiani et al., 2023).

This indicates that digital literacy and intrinsic motivation play essential roles in enhancing students' learning outcomes, particularly in chemistry education. Digital literacy allows students to access, evaluate, and utilize digital information more effectively. Moreover, intrinsic motivation, which is an internal drive to learn, can help students achieve better learning results. The combination of strong digital literacy and intrinsic motivation is believed to significantly boost students' academic achievements. Therefore, this research seeks to delve deeper into the role of digital literacy and intrinsic motivation from the viewpoint of high-achieving students at SMA Negeri 1 Kerinci.

Method

This research employs a descriptive qualitative method with a case study design, focusing on high-achieving students from SMA Negeri 1 Kerinci who have participated in the National Science Competition (KSN) in chemistry, mathematics, biology, and physics. The research population consists of 10 students selected based on their achievements in these competitions.

The research instruments include observations and in-depth interviews. To measure digital literacy, the study utilizes six key indicators: finding information, using multiple sources of information, selecting appropriate information sources, evaluating the information obtained, considering the source and impact of the message, and utilizing information to produce original work. The questions related to digital literacy are adopted from (Greenstein,

2012). Meanwhile, intrinsic motivation is measured through three indicators: high learning activity, persistence in completing tasks, and resilience in facing exams, adapted from (Nababan, 2014). These questions were developed based on previously validated research.

Observations and in-depth interviews were conducted to gather more comprehensive data on students' digital literacy and intrinsic motivation. The data collected provides deeper insights into students' experiences in using digital literacy and how their intrinsic motivation plays a role in their learning process.

In the data analysis process, the researcher utilized a qualitative analysis approach based on the Miles and Huberman model, which encompasses three key phases: data reduction, data presentation, and drawing or verifying conclusions (Costigliola, 2019). This technique was chosen as it aligns with the type of data being analyzed, obtained through the various data collection methods used in this study.

Result and Discussion

Digital Literacy

Interviews about the "Finds" indicator (finding information) in digital literacy among students at SMA Negeri 1 Kerinci show that most respondents have strong abilities to search for and filter accurate chemistry information online. They generally utilize various reliable sources such as scientific journals, educational websites, and compare information from different sources to distinguish between facts and opinions. Although some students face challenges in finding the right keywords, they tend to overcome these by trying different combinations of words, consulting experts, or referring to books and other sources for the needed information. Overall, respondents demonstrate good initiative and independence in seeking and managing relevant information.

The "Finds" indicator reflects students' ability to filter various information options and independently find information relevant to the issues they face (Hardianto et

al., 2023). Despite having fairly good skills in selecting relevant sources and information, limitations in digital literacy still pose challenges. Low digital literacy is attributed to students' lack of skills in evaluating and critiquing various digital content (Yusuf et al., 2022). Additionally, limited access to information sources exacerbates the issue, compounded by suboptimal implementation of learning models and assignments using online systems or digital media (Rahayu & Mayasari, 2018).

Interviews about the "Use Multiple Sources" indicator in digital literacy at SMA Negeri 1 Kerinci reveal that most respondents effectively use digital spaces to discuss chemistry material, although some face technical challenges. They use various online platforms, such as chat groups and specialized forums, to exchange ideas and discuss topics, and feel capable of participating well in these discussions. Some respondents also face technical issues, such as internet connection problems or incompatible file formats, but they manage these by seeking solutions, such as using file converters or technical support. This indicates that respondents are skilled in using various digital sources and formats to support their learning.

Using digital tools like text or digital messages, videos, illustrations, and audio recordings (such as podcasts) contributes to empowering digital literacy (Ananda et al., 2023; Mudra, 2020). This empowerment is also supported by integrating digital literacy materials into the school curriculum and providing various digital tools to support students' learning processes (Kaeophanuak et al., 2018). Additionally, digital literacy can be applied in everyday life when completing tasks or solving problems. Using digital literacy in real-world contexts helps students develop skills useful in various aspects of life.

Interviews about the "Selects" indicator (selecting appropriate information sources) in digital literacy at SMA Negeri 1 Kerinci show that respondents have a good ability to select the right and relevant chemistry information sources for solving everyday problems. They generally verify information from reliable sources such as the

internet, books, and proven accurate sources. Some respondents also categorize information based on relevance, accuracy, and the complexity of the issue at hand. Additionally, they tend to choose information suited to specific needs and contexts, demonstrating decision-making skills in information use. Students' digital literacy can be improved through active habits in searching, processing, analyzing, and interpreting various data and information.

The "Selects" indicator reflects students' ability to choose information sources and make decisions based on information relevant to their goals or issues. In the context of digital literacy, this skill is crucial given the vast and varied information on the internet, not all of which is of adequate quality (Ananda et al., 2023). Therefore, the ability to filter and select the right information is essential to ensure students obtain quality information suited to their needs.

Interviews about the "Evaluates" indicator (evaluating obtained information) in digital literacy at SMA Negeri 1 Kerinci reveal that respondents generally have a good ability to evaluate conflicting information by checking the credibility of authors and sources and identifying potential biases. They typically address this by seeking additional sources, such as scientific journals, educational websites, or consulting experts for clarification. Some respondents also combine information from various sources or choose information more widely accepted by credible sources. This indicates that respondents are capable of authenticating sources and authors and critically assessing information to ensure its accuracy and reliability.

The "Evaluates" indicator reflects students' ability to assess various information and recognize potential biases in the content they receive. Digital literacy is crucial for students to evaluate online content, including assessing source credibility, identifying biases, and determining the reliability of information (Polizzi, 2020).

Interviews about the "Considers Source/Message Effect" indicator (considering the source and impact of the message) in digital literacy at SMA Negeri 1 Kerinci show that most respondents are aware of digital safety, copyright, and the risks of media addiction. They generally exercise caution with digital technology by not sharing personal information with untrusted sources, properly citing sources, and using strong passwords. Respondents are also aware that information sources may have biases that affect decisions, and they strive to verify information accuracy before sharing it. Additionally, to address media addiction risks, many of them limit screen time, create strict schedules, and seek alternative activities unrelated to digital media. Overall, respondents show awareness of potential biases in information sources and take steps to minimize their influence on their decisions.

The "Considers Source/Message Effect" indicator reflects students' awareness of biases in information that may affect their decisions. Digital literacy is essential for helping students critically consider various information to avoid being trapped by false news or distorted information due to ignorance or cognitive biases (Fauzi & Murhamah, 2021).

Interviews about the "Uses to Produce Original Work" indicator (using information to produce original work) in digital literacy at SMA Negeri 1 Kerinci show that respondents have a good understanding of using digital technology to create original work and collaborate with peers on chemistry projects. They utilize digital tools such as Google Drive, PowerPoint, and other applications to organize information, create presentations, educational videos, and write reports. Although some face challenges in analyzing, filtering, and combining information from various sources, they overcome these by comparing information, verifying with reliable sources, and seeking help from teachers or peers. Respondents are also aware of the importance of citing references to avoid plagiarism, support work credibility, and ensure the accuracy of the information used. Empowering digital

literacy provides students with opportunities to develop their abilities in using and creating works with digital technology (Spante et al., 2018).

Intrinsic Motivation

Based on interviews about high learning activity, SMA Negeri 1 Kerinci students show strong motivation for independent learning, using various strategies to maintain enthusiasm, such as listening to music, seeking inspiration from interesting topics, and managing study time effectively. They also regularly check and revise chemistry assignments carefully, often studying outside school hours despite varying intensity, and strive to organize study time more effectively. However, some students feel their study time is not yet fully optimal, indicating room for improvement in their time management.

Based on interviews about perseverance in completing tasks, SMA Negeri 1 Kerinci students show consistent efforts in seeking study materials or sources, utilizing various media including books, the internet, and other digital sources for broader information. They remain motivated in completing chemistry tasks, even when they are challenging and time-consuming, by breaking tasks into smaller parts, remembering long-term goals, and maintaining enthusiasm through breaks or discussions with peers. This approach reflects their perseverance in learning and striving for optimal results.

Based on interviews about students' tenacity in facing exams, it is observed that they are proactive in seeking a deeper understanding of chemistry material through interactions with teachers and peers. They ask questions clearly and politely, both directly and through chat groups, and discuss to strengthen their understanding. In collaborative learning, students use digital platforms and online forums to discuss, share information, and find solutions together. This collaborative approach helps them overcome difficulties and prepare better for exams.

The findings are consistent with previous research indicating that students

with high learning motivation tend to show positive learning attitudes and behaviors, such as perseverance in their learning activities. Students with high motivation display behaviors such as frequently seeking recommended learning materials, checking assignment completeness before submission, not getting bored quickly with subjects, striving to improve incorrect tasks based on teacher feedback, and continuously working on assignments until achieving satisfactory results (Herlina et al., 2015).

Conclusion

Based on the findings of this research, it can be concluded that digital literacy and intrinsic motivation are essential in fostering students' academic success, particularly in chemistry education at SMA Negeri 1 Kerinci. Digital literacy, encompassing the abilities to locate, utilize, select, evaluate, and apply digital information, has proven to be instrumental in helping students access, analyze, and use information more effectively and accurately. Students who excelled in the National Science Competition (KSN) displayed strong digital literacy skills, as evidenced by their proactive efforts to seek information from various reliable sources, verify its accuracy, and produce credible original work. Intrinsic motivation also plays a significant role in students' academic success. Those with high intrinsic motivation engage in rigorous learning activities, persist in completing tasks, and demonstrate determination in preparing for exams. To sustain their enthusiasm for learning, these students employ strategies such as effective time management, collaboration with peers, and the use of digital technology in their studies. The synergy between strong digital literacy and high intrinsic motivation is believed to greatly enhance students' academic performance. Thus, it is crucial to continuously promote the development of digital literacy and the enhancement of intrinsic motivation within the educational context, particularly in science fields, to support students' learning success and equip them for future challenges.

References

- Ananda, O. T., Mahanal, S., & Susanto, H. (2023). Literasi Digital Siswa: Studi Deskriptif pada Pembelajaran Biologi di SMA. *Bioscientist: Jurnal Ilmiah Biologi*, 11(2), 1100. <https://doi.org/10.33394/bioscientist.v11i2.8815>
- Costigliola, F. C. (2019). Library of Congress Cataloging in Publication Data. *Awkward Dominion*, 381–382. <https://doi.org/10.7591/9781501721144-016>
- Dewi, L. E., Syofyan, R., Putra, D. G., Ekonomi, D. P., Ekonomi, F., & Negeri, U. (2024). Pengaruh Literasi Digital dan Motivasi Belajar Terhadap Hasil Belajar Siswa. *Jurnal Ecogen*, 7(2), 288–298.
- Eriany, P., Hernawati, L., & Goeritno, H. (2013). Studi Deskriptif Mengenai Faktor-Faktor yang Mempengaruhi Motivasi Mengikuti Kegiatan Bimbingan Belajar pada Siswa SMP di Semarang. *Psikodimensia*, 13(1), 115–130.
- Fauzi, & Murhamah. (2021). Pengaruh Literasi Digital Terhadap Pencegahan Informasi Hoaks pada Remaja di SMANegeri 7 Kota Lhokseumawe The Effect of Digital Literacy on the Prevention of Hoax Information on Adolescents in SMANegeri 7 of Lhokseumawe City. *Jurnal Pekommas*, 6(2), 77–84. <https://doi.org/10.30818/jpkm.2021.2060210>
- Greenstein, L. (2012). *Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning*. Corwin Press.
- Hardianto, H., Mahanal, S., & Zubaidah, S. (2023). The RICOSRE-FC Potential in Improving High School Students' Critical Thinking Skills. *JPBIO (Jurnal Pendidikan Biologi)*, 8(1), 1–11. <https://doi.org/10.31932/jpbio.v8i1.2004>
- Hardika, A., & Isroah. (2022). Pengaruh Ketersediaan Fasilitas, Literasi Digital, Dan Motivasi Belajar Terhadap Efektivitas Perkuliahan Daring Pada Mahasiswa Program Studi Pendidikan Akuntansi FE UNY Angkatan 2018 dan 2019. *Kajian Pendidikan Akuntansi Indonesia*, 11(3), 73–92.
- Herlina, T., Nurhayati, B., & Andi, M. (2015). Peningkatan Motivasi, Aktivitas, Dan Hasil Belajar Peserta Didik Melalui Penerapan Strategi Pembelajaran Discovery-Inquiry Di Kelas Xc Man Binamu Jenepono. *Jurnal Biotek*, 3(1), 67–77.
- Kaeophanuek, S., Jaitip, N.-S., & Nilsook, P. (2018). How to Enhance Digital Literacy Skills among Information Sciences Students. *International Journal of Information and Education Technology*, 8(4), 292–297. <https://doi.org/10.18178/ijiet.2018.8.4.1050>
- Kajin, S. (2018). Pengaruh Pembelajaran Berbasis Literasi Digital Terhadap Motivasi Dan Hasil Belajar Kognitif di MTs N Mojokerto dan MTs N Soko Mojokerto. *PROGRESSA: Journal of Islamic Religious Instruction*, 2(1), 133–142. <https://doi.org/10.32616/pgr.v2.1.119>
- Mudra, H. (2020). Digital Literacy Among Young Learners: How Do Efl Teachers and Learners View Its Benefits and Barriers?. *Teaching English with Technology*, 20(3), 3–24.
- Patmanthara, S., & Hidayat, W. N. (2018). Improving Vocational High School Students Digital Literacy Skill through Blended Learning Model. *Journal of Physics: Conference Series*, 1028(1). <https://doi.org/10.1088/1742-6596/1028/1/012076>
- Polizzi, G. (2020). Digital Literacy and the National Curriculum for England: Learning from how the Experts Engage with and Evaluate Online Content. *Computers and Education*, 152 (February), 103859. <https://doi.org/10.1016/j.compedu.2020.103859>
- Rahayu, T., & Mayasari, T. (2018). Profil Kemampuan awal Literasi Digital dalam Pembelajaran Fisika Siswa SMK Kota Madiun. *Seminar Nasional Quantum*, 25, 431.

- Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital Competence and Digital Literacy in Higher Education Research: Systematic Review of Concept Use. *Cogent Education*, 5(1), 1–21.
<https://doi.org/10.1080/2331186X.2018.1519143>
- Tristiani, A. P., Suartana, I. K., & Suryanto, I. W. (2023). Penerapan Literasi Digital Dalam Meningkatkan Motivasi Dan Prestasi Belajar Siswa Pada Mata Pelajaran Produk Cake Dan Kue Indonesia. *Cetta: Jurnal Ilmu Pendidikan*, 6(2), 251–259.
<https://doi.org/10.37329/cetta.v6i2.1918>
- Wijayati, N., Kusuma, E., Sri, D., & Sumarti, S. (2019). Pembelajaran Berbasis Digital Di Jurusan Kimia Fmipa Unnes. *Jurnal Inovasi Pendidikan Kimia*, 13(1), 2318–2325.
- Yusuf, A. M., Hidayatullah, S., & Tauhidah, D. (2022). The Relationship Between Digital and Scientific Literacy with Biology Cognitive Learning Outcomes of High School Students. *Assimilation: Indonesian Journal of Biology Education*, 5(1), 9–18.
<https://doi.org/10.17509/aijbe.v5i1.43322>