JPPIPA 9(4) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Chemistry Learning Media Based on Social Media: Students' View

Sri Yamtinah[1*], Ari Syahidul Shidiq[1], Hayuni Retno Widarti[2], Mawardi[3]

[1] Chemistry Education Study Program, Universitas Sebelas Maret, Surakarta, Indonesia.
[2] Chemistry Education Study Program, Universitas Negeri Malang, Malang, Indonesia.
[3] Chemistry Department, Universitas Negeri Padang, Padang, Indonesia.

Received: February 25, 2023
Revised: April 23, 2023
Accepted: April 25, 2023
Published: April 30, 2023

Corresponding Author:
Sri Yamtinah
jengtina@staff.uns.ac.id

DOI: 10.29303/jppipa.v9i4.3359

Abstract: Chemistry learning should be able to integrate contextual chemistry problems and present the sophistication of 21st-century learning technology. Social media, as a product of 21st-century technology, has the potential to be used as chemistry learning media. Therefore, this study aims to investigate students' views toward the potential use of social media as chemistry learning media. The survey method involved 791 students. A total of 40 question items were developed and distributed online using a Google form to respondents. Based on the results of a survey conducted, it is known that respondents are accustomed to using Instagram and TikTok as the most frequently used social media. Other results reveal that most respondents have the same screen time, more than 4 hours daily. This screen time is used by respondents for entertainment and looking for news information on social media. With the length of screen time not used for this learning process, it can be a promising opportunity to utilize social media as a medium for learning chemistry. This study is expected to be a reference for developing social media-based chemistry learning to increase student motivation and achievement.

Keywords: Chemistry learning media; Instagram; Students view

Introduction

Chemistry is considered to have a central role in education for sustainable development (Burmeister et al., 2012; Shidiq et al., 2020). It is based on the core role that the chemical industry may play in sustainable development (Burmeister et al., 2012, 2013; Shidiq et al., 2021). From a broad continuing education perspective, chemistry classrooms can be a place for developing general and chemistry-specific skills and knowledge (Holbrook & Rannikmae, 2007). Therefore, chemistry learning should be able to integrate contextual chemistry problems from the real world, train the required thinking skills, and present the sophistication of 21st-century learning technology (Care et al., 2018; Griffin et al., 2012; Shidiq & Yamtinah, 2019; Trilling & Fadel, 2009).

Technological advances in recent decades have encouraged the education sector to integrate technology into curricula in various subjects (Kong, 2014). The development of technology and the Internet has driven a new balance of teaching and learning environments such as online learning media, distance learning, computer-assisted learning, and hybrid learning. Effective and relevant teaching and learning strategies are needed to meet the current generation's needs. Students in the 21st-century era prefer digital resources to access information, communicate, and solve problems (Juanda et al., 2021)

There have been many studies that have developed and integrated technology in chemistry learning, such as the use of online video tutorial technology in analytical chemistry learning (He et al., 2012), the use of (He et al., 2012) the use of Augmented Reality (AR) technology in chemistry learning (Al-Balushi et al., 2017; Kartimi et al., 2022; Macariu et al., 2020; Naese et al., 2019; Ovens et al., 2020) and what is developing according to the context of students' daily lives is the use of social media as chemistry learning (Fosu et al., 2019; Osokoya & Kazeem, 2016)

The use of social media as a medium for learning chemistry, is considered interesting and can increase

How to Cite:
Yamtinah, S., Shidiq, A. S., Widarti, H. R., & Mawardi, M. (2023). Chemistry Learning Media Based on Social Media: Students' View. *Jurnal Penelitian Pendidikan IPA*, *9*(4), 1713–1719. https://doi.org/10.29303/jppipa.v9i4.3359

students' motivation and digital literacy (Hayes et al., 2020; Hurst et al., 2019) This opens up opportunities for teachers and researchers in the field of chemistry education to develop social media-based chemistry learning media. For this reason, it is necessary to review the types of social media that are relevant as a medium for learning chemistry. Therefore, this study aims to investigate students' views on the use of social media as a chemistry learning medium and map the potential use of social media. This research is expected to provide an overview of the needs and opportunities for research on social media development as a chemistry learning media.

Method

This research was conducted using the survey method. A research instrument of 40 items of open and closed questions was shared through Google Forms online. This instrument was developed to include five main components related to the views of survey respondents, namely the implementation of online and offline learning, characteristics of chemical materials, Multiple Chemical Representations, social media needs, and attitudes. The instrument grids used are presented in Table 1.

Table 1. Instrument Grid

Main Component	Indicator	Number and Type of Questions
Implementation of Online and Offline Learning	Learning process	4 Closed-choice questions
	Learning Media	4 Closed questions
	Learning Evaluation	4 Closed questions
Characteristics of Chemistry topics	Difficult material	2 Choice questions
	Easy material	2 Choice questions
	Reaction rate	3 Choice questions
Multiple Representations	Symbolic	1 Question with scaled answer choices
	Submicroscopic	1 Question with scaled answer choices
	Macroscopic	1 Question with scaled answer choices
Content creator/ social media	Knowledge	3 Questions (open and closed)
	Skills	3 Questions with scaled answer choices
	Behavior	3 Questions with scaled answer choices
Attitudes		8 questions (open and closed)
Total		40 Questions

Respondents to the survey conducted were 791 high school students. The data obtained are analyzed using quantitative and qualitative data analysis techniques. The instrument grid data is shown in Table 1 and student demographic data is shown in Table 2. The research flow design can be seen in Figure 1.

Table 2. Demographic Data of Student

Demographic Data	Sum	%	
Gender	Man	183	23.1
	Woman	608	76.9
Class	X	321	40.6
	XI	201	25.4
	XII	269	34
Type of Schools	Privat	82	10.4
	Public	709	89.6
Location	Centre Java	781	98.7
	Others Province	10	11.3

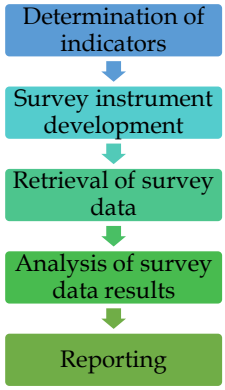

Figure 1. The research flow chart

Result and Discussion

Learning technology continues to develop significantly from time to time. This allows the teaching and learning process to be more effective and efficient to obtain better results. Therefore, education needs to adopt various ways of learning that can support these changes (Febri et al., 2020). In addition, the rapid exchange of information through various media around the world helps the growth of human knowledge and, demands a redefinition of educational curricula (Pevac et al., 2005). One of the important components in the educational curriculum is learning methods and media. Learning in schools usually uses traditional learning methods and media such as lectures and using textbooks. There are so many theories listed in the book, but there are many students who are not interested, not even reading the book because it is considered less interesting. This is because books use only one of the five senses in their use, namely the eyes images and text alone are not enough in the delivery of material (Bustanil S et al., 2019; Purba, Liliana, & Kwarrie, 2018; Purba, Liliana, & Runtulalu, 2018). Through the questionnaires that were distributed, it was revealed the model and media most often used by chemistry teachers in schools. The survey results data on the learning model is

displayed in Figure 2 and the data on learning media is displayed in Figure 3.

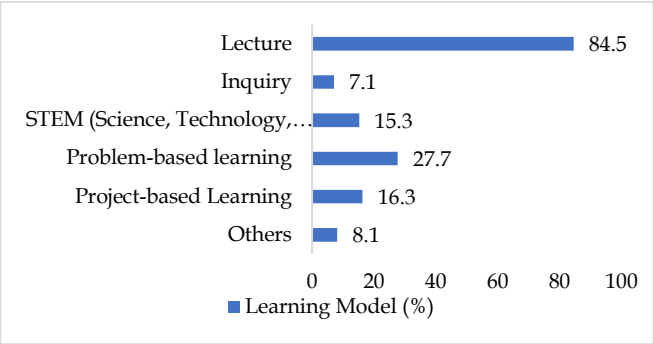

Figure 2. Learning models usually used by chemistry teachers

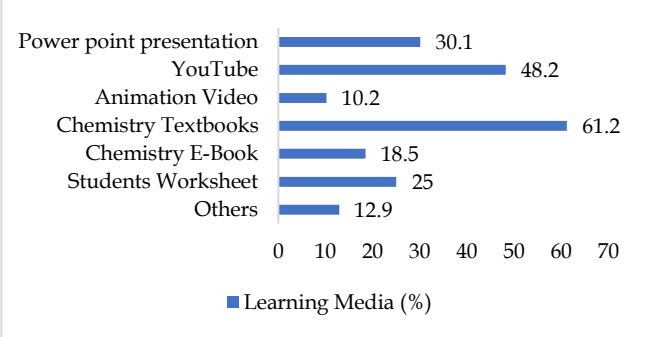

Figure 3. Learning media usually used by chemistry teachers

Based on Figure 2 it is known that more chemistry teachers use the learning model with lectures (Lectures). The lecture method is good for providing understanding to students in the same direction. Nevertheless, this method is considered less effective for the formation of student conceptions. Students are only passive in listening and not constructing their own knowledge. Therefore, teacher-centered lecture methods should now begin to be reduced, to be replaced with student-centered learning models. Another number of frequencies that indicate the learning model that is often used by chemistry teachers is Problem-based learning. Unlike the teacher-centered lecture method, this PBL model makes students the center of learning. Students are given a contextual problem related to chemistry learning so that they can construct their own knowledge. This model allows students to actively explore subject matter from different sources and different perspectives (Ayyildiz & Tarhan, 2018; Quattrucci, 2018).

In addition, the learning medium that is often used by chemistry teachers based on table 2 is the Chemistry textbook. This is very natural because all schools are waiting for printed books as their main learning resource. However, along with technological advances, it is necessary to innovate the use of technology-based learning media in chemistry classes. This is in order to increase students' learning motivation towards chemistry, and improve their technological literacy (Mawson, 2013; Salta & Koulougliotis, 2015; Thummathong & Thathong, 2018). The use of technology as a medium for learning chemistry is important. Because not all chemicals can be explained through print media. It takes multimedia that can visualize abstract concepts of chemical matter. In addition, it is also useful for teaching chemistry through representations of chemistry, sub-microscopic, macros, and symbolic. The representation of sub-microscopic will be difficult to explain if only using printed books. The survey results in figure 4 show how often chemistry teachers do sub-microscopic explanations according to respondents.

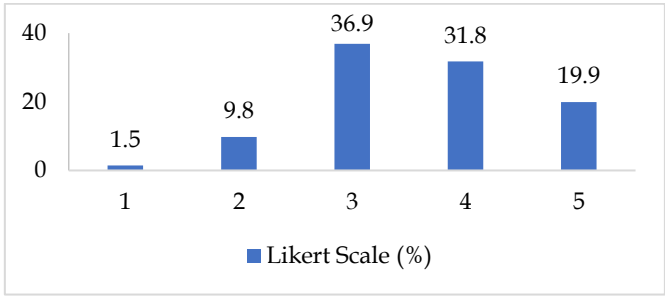

Figure 4. Frequencies chemistry teachers explain on the representation of sub-microscopic levels

The data in figure 4 shows that chemistry teachers have explained at the sub-microscopic level but the frequency is still rare. 3D representation and visualization in chemistry learning is traditionally typically done using physical models, such as ball and stick molecular kits (Battle et al., 2010) However, this method has not been able to fully represent and visualize chemical reactions. Along with the development and accessibility of the latest computing technology, 3D representation and visualization can be done with digital simulations using *Augmented Reality* technology and animated video (Abdinejad et al., 2020; Dave et al., 2019; Pence et al., 2015; Sampson et al., 2018). Recently, along with the development of online learning, video-based learning media on various platforms including social media has become a trend. This opens up opportunities for teachers to be able to innovate the creation of similar learning media. Data related to student social media is displayed in figures 5, 6 and 7.

Figures 5, 6 and 7 provide interrelated information. Figure 5 presents data related to the length of time students do screentime. The majority of students answer that they spend 3-4 hours a day. The majority of their screentime activities are filled with opening social media. In Figure 6, information is presented that the social media of Instagram, YouTube and TikTok are the

social media that most students have. Meanwhile, Figure 7 shows data that the purpose of students to open social media is for entertainment. This data provides morning opportunities for teachers and researchers in the field of chemistry education, with a long screentime on social media, it is possible to use social media for learning purposes. Because the frequency of students using social media for learning purposes is still low. In Table 3. Presented data on students' views regarding the use of social media as a medium for learning chemistry.

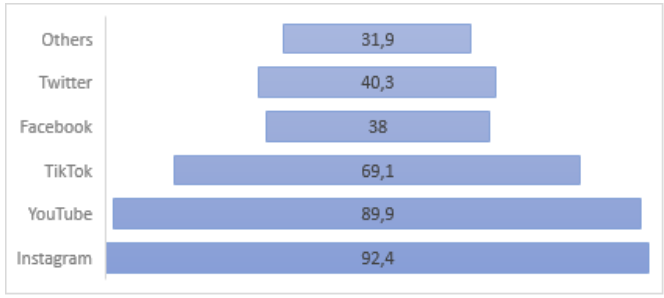

Figure 6. Social media that student have

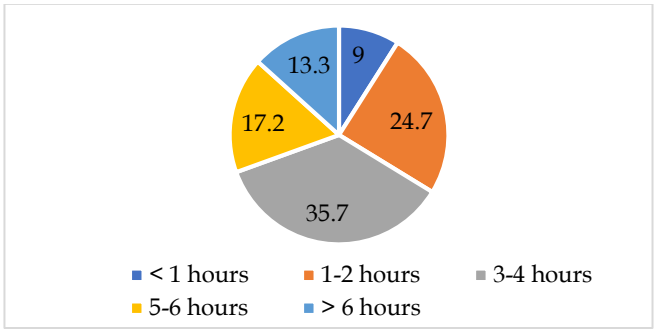

Figure 5. Student screen time (%)

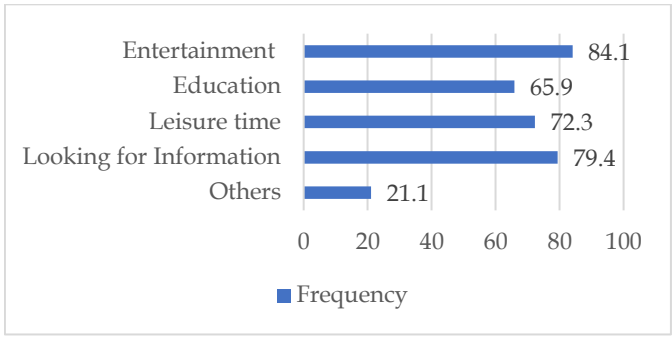

Figure 7. Purpose of use of social media

Table 3. Students' Views Regarding the Use of Social Media as a Medium for Learning Chemistry

Questions	Students View
In your opinion, why is social media (can/can't) be used as a medium for learning chemistry?	Social media can be used as chemistry learning because in social media there are also those who present content or posts about learning which is the impact of the pandemic which requires students to use social media as a learning medium.
	social media can be used to learn chemistry because some of the information on the Instagram, YouTube, or Twitter applications can be used to find chemistry materials that can be learned by students, because sometimes the material provided by the teacher is incomplete and difficult to understand, just give but sometimes not explain
	The sophistication of technology can now be utilized in various fields, one of which is education, many digital platforms today can help and benefit students in understanding chemistry learning, besides that with this social media students are not easily bored.
In your opinion, what are the advantages of using social media as a chemistry learning medium?	Through social media, students can actively be more creative and independent so that the quality of lessons can be improved both in terms of knowledge and quality.
	Foster students' interest in learning because the lessons become more interesting. Clarify the meaning of the lesson material so that students more easily understand it.
	The advantage is that by using social media for chemistry learning media, it will be more effective to convey material because it is easier to access, besides that today's children prefer to watch and hear rather than read. Then with the work on the questions with the application, I think it is more delicious because it can be done flexibly and not fixated by the regulations of the teacher.
In your opinion, what are the disadvantages of using social media as a chemistry learning medium?	We can easily be tempted by videos or notifications that make us want to see/watch them and forget the original purpose of using social media, namely for learning lack of understanding in the delivery of material, not free because you can't ask directly, not all networks in a place are good, it will be even more detrimental because you have to buy quotas and be exposed to radiation.
	The disadvantages is, there are still many children who remain recalcitrant and do not open the material presented by the teacher

Questions	Students View
	because they are too cool with games or other applications. For the work on the questions, the disadvantage is that if the questions can be accessed via cellphones or other digital devices, it will be very easy for students to find answers on the internet or just ask friends for answers through chat applications. Then if to access materials and learning questions requires an internet network for some students, they will still get problems such as unavailability of the network, data quota runs out, or slow Wi-Fi.

Based on data from table 3, it is known that students have a positive view regarding the use of social media as a medium for learning chemistry. Many people use social media platforms such as Twitter, Facebook and YouTube, and many make these platforms a part of their daily lives. According to estimated 2016 data, there are more than 750 million active users on Facebook, 177 million tweets are sent daily on Twitter, and more than 3 billion people watch YouTube daily (Osokoya & Kazeem, 2016). Students spend a lot of time uploading, downloading and viewing content on social media. Most students are always online, chatting with friends and watching movies. Some students have made social media sites a habit; they struggle to concentrate for an hour without checking any of the sites and can be considered Internet addicts (Osokoya & Kazeem, 2016)

Social media is an online media that is used for communication needs, interacting, participating, sharing and creating content/content for its users to use through special application devices with internet networks without being limited by time or space. The purpose of using social media is as a means of communication to connect fellow users with a very wide coverage area. With this social media, users can connect with many people, discuss together, create forums, upload daily activities, and share other information easily through an internet connection. The use of social media for the benefit of learning is not many who use it, but with the large number of internet users in Indonesia who use social media, this media opportunity can be used to alternative media in learning, and one of the most popular social media today is Instagram after YouTube and TikTok. Instagram is a social media platform that is quite popular among young people today. Various moments and events are captured in Instagram posts for various purposes, including to get responses from fellow users. This is interesting, because now learning contemporary chemistry through Instagram social media accounts that can be accessed anytime and anywhere (Fujiawati & Raharja, 2021).

Conclusion

Based on the results of a survey conducted, it is known that respondents are accustomed to using Instagram and TikTok as the most frequently used social media. Other results reveal that most of the respondents have the same screen time, which is more than 4 hours every day. This screen time is used by respondents for entertainment and looking for news information on social media. With the length of screen time that has not been used for this learning process, it can be a promising opportunity to utilize social media as a medium for learning chemistry. This research is expected to be a reference for the development of social media-based chemistry learning to increase student motivation and achievement.

References

Abdinejad, M., Talaie, B., Qorbani, H. S., & Dalili, S. (2020). Student Perceptions Using Augmented Reality and 3D Visualization Technologies in Chemistry Education. *Journal of Science Education and Technology*. https://doi.org/10.1007/s10956-020-09880-2

Al-Balushi, S. M., Al-Musawi, A. S., Ambusaidi, A. K., & Al-Hajri, F. H. (2017). The Effectiveness of Interacting with Scientific Animations in Chemistry Using Mobile Devices on Grade 12 Students' Spatial Ability and Scientific Reasoning Skills. *Journal of Science Education and Technology*, *26*(1), 70–81. https://doi.org/10.1007/s10956-016-9652-2

Ayyildiz, Y., & Tarhan, L. (2018). Problem-based learning in teaching chemistry: enthalpy changes in systems. *Research in Science and Technological Education*, *36*(1), 35–54. https://doi.org/10.1080/02635143.2017.1366898

Battle, G. M., Allen, F. H., & Ferrence, G. M. (2010). Teaching three-dimensional structural chemistry using crystal structure databases. 2. Teaching units that utilize an interactive web-accessible subset of the Cambridge Structural Database. *Journal of Chemical Education*, *87*(8), 813–818. https://doi.org/10.1021/ed100257t

Burmeister, M., Rauch, F., & Eilks, I. (2012). Education for Sustainable Development (ESD) and chemistry education. *Chemistry Education Research and Practice*, *13*(2), 59–68. https://doi.org/10.1039/c1rp90060a

Burmeister, M., Schmidt-Jacob, S., & Eilks, I. (2013). German chemistry teachers' understanding of sustainability and education for sustainable

development - An interview case study. *Chemistry Education Research and Practice*, *14*(2), 169–176. https://doi.org/10.1039/c2rp20137b

Bustanil S, M., Asrowi, & Adianto, D. T. (2019). Pengembangan Media Pembelajaran Interaktif Berbasis Video Tutorial Di Sekolah Menengah Kejuruan. *JTP - Jurnal Teknologi Pendidikan*, *21*(2), 119–134. https://doi.org/10.21009/jtp.v21i2.11568

Care, E., Griffin, P., & Wilson, M. (2018). *Assessment and Teaching of 21st Century Skills* (E. Care, P. Griffin, & M. Wilson (eds.)). Springe. https://doi.org/10.1007/978-3-319-65368-6

Dave, I. R., Chaudhary, V., & Upla, K. P. (2019). Simulation of Analytical Chemistry Experiments on Augmented Reality Platform. In *Progress in Advanced Computing and Intelligent Engineering* (Vol. 714, pp. 393–403). Springer Singapore. https://doi.org/10.1007/978-981-13-0224-4_35

Febri, A., Sajidan, S., Sarwanto, S., & Harjunowibowo, D. (2020). Guided Inquiry Lab: Its Effect to Improve Student's Critical Thinking on Mechanics. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *9*(1), 87–97. https://doi.org/10.24042/jipfalbiruni.v9i1.4630

Fosu, M. A., Gupta, T., & Michael, S. (2019). Social Media in Chemistry: Using a Learning Management System and Twitter to Improve Student Perceptions and Performance in Chemistry [Chapter]. *ACS Symposium Series*, *1318*, 185–208. https://doi.org/10.1021/bk-2019-1318.ch013

Griffin, P., Care, E., & McGaw, B. (2012). *Assessment and Teaching of 21st Century Skills* (P. Griffin, B. McGaw, & E. Care (eds.)). Springer Netherlands. https://doi.org/10.1007/978-94-007-2324-5

Hayes, C., Stott, K., Lamb, K. J., & Hurst, G. A. (2020). "Making Every Second Count": Utilizing TikTok and Systems Thinking to Facilitate Scientific Public Engagement and Contextualization of Chemistry at Home. *Journal of Chemical Education*, *97*(10), 3858–3866. https://doi.org/10.1021/acs.jchemed.0c00511

He, Y., Swenson, S., & Lents, N. (2012). Online video tutorials increase learning of difficult concepts in an undergraduate analytical chemistry course. *Journal of Chemical Education*, *89*(9), 1128–1132. https://doi.org/10.1021/ed200685p

Holbrook, J., & Rannikmae, M. (2007). The Nature of Science Education for Enhancing Scientific Literacy. *International Journal of Environmental and Science Education*, *29*(11), 1347–1362. https://doi.org/10.1080/09500690601007549

Hurst, G. A., Slootweg, J. C., Balu, A. M., Climent-Bellido, M. S., Gomera, A., Gomez, P., Luque, R., Mammino, L., Spanevello, R. A., Saito, K., & Ibanez, J. G. (2019). International Perspectives on Green and Sustainable Chemistry Education via Systems Thinking. *Journal of Chemical Education*, *96*(12), 2794–2804. https://doi.org/10.1021/acs.jchemed.9b00341

Juanda, A., Maulida, A. N., Gloria, R. Y., & Nasrudin, D. (2021). Learning Observation: The Demands of 21st Century Biology Learning in Senior High School. *Jurnal Pendidikan Sains Indonesia*, *9*(3), 445–458. https://doi.org/10.24815/jpsi.v9i3.20162

Kartimi, K., Yunita, Y., Addiin, I., & Shidiq, A. S. (2022). A Bibliometric Analysis on Chemistry Virtual Laboratory. *Educación Química*, *33*(2), 194. https://doi.org/10.22201/fq.18708404e.2022.2.80579

Kong, S. C. (2014). Developing information literacy and critical thinking skills through domain knowledge learning in digital classrooms: An experience of practicing flipped classroom strategy. *Computers and Education*, *78*, 160–173. https://doi.org/10.1016/j.compedu.2014.05.009

Macariu, C., Iftene, A., & Gîfu, D. (2020). Learn chemistry with augmented reality. *Procedia Computer Science*, *176*, 2133–2142. https://doi.org/10.1016/j.procs.2020.09.250

Mawson, W. B. (2013). Emergent technological literacy: What do children bring to school? *International Journal of Technology and Design Education*, *23*(2), 443–453. https://doi.org/10.1007/s10798-011-9188-y

Naese, J. A., McAteer, D., Hughes, K. D., Kelbon, C., Mugweru, A., & Grinias, J. P. (2019). Use of Augmented Reality in the Instruction of Analytical Instrumentation Design. *Journal of Chemical Education*, *96*(3), 593–596. https://doi.org/10.1021/acs.jchemed.8b00794

Osokoya, M. M., & Kazeem. (2016). Social Media and Learning Styles as Correlates of Senior Secondary Students' Chemistry Achievement in Abeokuta, Ogun State, Nigeria. *Journal of Sociological Research*, *7*(2), 1–17. https://doi.org/10.5296/jsr.v7i2.9902

Ovens, M., Ellyard, M., Hawkins, J., & Spagnoli, D. (2020). Developing an Augmented Reality Application in an Undergraduate DNA Precipitation Experiment to Link Macroscopic and Submicroscopic Levels of Chemistry. *Journal of Chemical Education*, *97*(10), 3882–3886. https://doi.org/10.1021/acs.jchemed.0c00481

Pence, H. E., Williams, A. J., & Belford, R. E. (2015). New Tools and Challenges for Chemical Education: Mobile Learning, Augmented Reality, and Distributed Cognition in the Dawn of the Social and Semantic Web. *Chemistry Education: Best Practices, Opportunities and Trends*, 693–734. https://doi.org/10.1002/9783527679300.ch28

Pevac, D. V., Milanovic, K. S., & Milosavljevic, M. M. (2005). E-learning Method Implementation in the

High School Vocational Education. *IEEE EUROCON 2005 - The International Conference on "Computer as a Tool,"* 835–838. https://doi.org/10.1109/eurcon.2005.1630062

Purba, K. R., Liliana, & Kwarrie, Y. N. P. (2018). Development of interactive learning media for simulating human blood circulatory system. *Proceedings - 2017 International Conference on Soft Computing, Intelligent System and Information Technology: Building Intelligence Through IOT and Big Data, ICSIIT 2017*, *2018-Janua*, 275–278. https://doi.org/10.1109/ICSIIT.2017.68

Purba, K. R., Liliana, & Runtulalu, D. (2018). Development of interactive learning media for simulating human digestive system. *Proceedings - 2017 International Conference on Soft Computing, Intelligent System and Information Technology: Building Intelligence Through IOT and Big Data, ICSIIT 2017*, *2018-Janua*, 270–274. https://doi.org/10.1109/ICSIIT.2017.67

Quattrucci, J. G. (2018). Problem-Based Approach to Teaching Advanced Chemistry Laboratories and Developing Students' Critical Thinking Skills. *Journal of Chemical Education*, *95*(2), 259–266. https://doi.org/10.1021/acs.jchemed.7b00558

Salta, K., & Koulougliotis, D. (2015). Assessing motivation to learn chemistry: Adaptation and validation of Science Motivation Questionnaire II with Greek secondary school students. *Chemistry Education Research and Practice*, *16*(2), 237–250. https://doi.org/10.1039/c4rp00196f

Sampson, D., Ifenthaler, D., Spector, J. M., & Isaías, P. (2018). Digital Technologies: Sustainable Innovations for Improving Teaching and Learning. In *Digital Technologies: Sustainable Innovations for Improving Teaching and Learning*. Springer International Publishing AG. https://doi.org/10.1007/978-3-319-73417-0

Shidiq, A. S., Permanasari, A., & Hernani. (2020). Review on education for sustainable development: System thinking for sustainable chemistry education curriculum. *Journal of Physics: Conference Series*, *1521*(4). https://doi.org/10.1088/1742-6596/1521/4/042080

Shidiq, A. S., Permanasari, A., Hernani, H., & Hendayana, S. (2021). Chemistry teacher responses to learning in the COVID-19 outbreak: Challenges and opportunities to create innovative lab-work activities. *Journal of Physics: Conference Series*, *1806*(1), 012195. https://doi.org/10.1088/1742-6596/1806/1/012195

Shidiq, A. S., & Yamtinah, S. (2019). Pre-service chemistry teachers' attitudes and attributes toward the twenty-first century skills. *Journal of Physics: Conference Series*, *1157*(4), 042014. https://doi.org/10.1088/1742-6596/1157/4/042014

Thummathong, R., & Thathong, K. (2018). Chemical literacy levels of engineering students in Northeastern Thailand. *Kasetsart Journal of Social Sciences*, *39*(3), 478–487. https://doi.org/10.1016/j.kjss.2018.06.009

Trilling, B., & Fadel, C. (2009). *21st Century Skills*. John Wiley & Sons.