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Research Article

Chemistry teacher and pre-service chemistry teacher views: Can social media be used as chemistry learning media?

Ari Syahidul Shidiq[1], Sri Yamtinah[1], and Hayuni Retno Widarti[2]

[1]*Chemistry Education Study Program, Universitas Sebelas Maret, Surakarta, Indonesia*
[2]*Chemistry Education Study Program, Universitas Negeri Malang, Malang, Indonesia*

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Keywords

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Corresponding author:
E-mail: arishidiq@staff.uns.ac.id
(Ari Syahidul Shidiq)

Abstract

Chemistry learning should be able to integrate contextual chemistry problems and present the sophistication of 21st-century learning technology. As a product of 21st-century technology, social media can be used as chemistry learning media. Therefore, this study aims to investigate the views of chemistry teachers and pre-service chemistry teachers toward the potential use of social media as chemistry learning media. The Purposed-designed survey method that involved 76 chemistry teachers and 109 pre-service chemistry teachers as respondents was used in this study. A total of 40 question items were developed and distributed online using a Google form to respondents. Based on the results of the survey conducted, it is known that during online and offline chemistry learning, respondents are accustomed to using YouTube as chemistry learning media. In addition, Instagram is the social media most widely owned by pre-service chemistry teachers, while Facebook is the social media most commonly owned by chemistry teachers. 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 this long screen time not used for learning, it can be a promising opportunity to use social media as chemistry learning media. This study is expected to be a reference for developing social media-based chemistry learning to increase student motivation and achievement.

Introduction

Chemistry is considered a central role in education for sustainable development (Burmeister et al. 2012, 2013; Shidiq et al. 2020b). From a broad sustainable education perspective, the chemistry classroom can be a place to develop general skills and knowledge in addition to chemistry-specific skills (Holbrook and Rannikmae, 2007; Holbrook, 2010). Therefore, chemistry learning should be able to integrate contextual chemistry problems from the real world, train the thinking skills needed, and present the sophistication of 21st-century learning technology (Trilling and Fadel, 2009; Griffin et al. 2012; Fadel, 2016; Care et al. 2018; Shidiq and Yamtinah, 2019). 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 digital animation in high school chemistry learning (Al-Balushi et al. 2017), and the use of technology Augmented Reality (AR) in chemistry learning (Naese et al. 2019; Macariu et al. 2020; Ovens et al. 2020; Yamtinah et al. 2022). Furthermore, the use of social media as a chemistry learning medium is currently developing (Osokoya and Kazeem, 2016; Fosu et al. 2019).

The way of communication preferred by students today is different from how students communicated in the past and may be different from the communication habits of teachers; this raises the possibility of miscommunication in the classroom (Fosu et al. 2019). Social media can be used as a means for students to improve their metacognition in chemistry and to communicate to teachers about problems that arise in class or

certain concepts they do not understand, rather than writing them on a sheet of paper. This method releases the tension of the worried students about their drawbacks (Lambić, 2016; Fosu et al. 2019).

Most social media users are young individuals who are primarily middle and high school students (Osokoya and Kazeem, 2016). The relationship between the youth and their involvement in social media has attracted much research focusing on social media activities and their learning process. Recently, there has been much discussion regarding the use of social media (e.g., Facebook, Twitter, WhatsApp, and YouTube) by students, especially high school students, and the possible effects of these tools on their academic performance (Hargittai and Hsieh, 2010). The Focus of this debate is whether high school students increased use of social media improves or worsens students' academic performance (Hargittai and Hsieh, 2010; Osokoya and Kazeem, 2016).

In chemistry education, this can be an alternative learning media to increase students' motivation and digital literacy (Hurst, 2018; Hayes et al. 2020). However, this does not rule out the lousy possibility that social media can reduce collaboration and enjoyment in learning (Sarwar et al. 2019). Teachers, including chemistry teachers, need to address the debate about using social media wisely. Therefore, this study intends to investigate the views of chemistry teachers and pre-service teachers on using social media as a medium for teaching chemistry. This is essential because teachers' views about something can affect their teaching (Shidiq and Yamtinah, 2019; Shidiq et al. 2020a). This research is expected to provide the potential and challenges of using social media as a medium for chemistry learning based on the views of Chemistry Teachers. The types of social media that have the potential to be used are also discussed in this study.

Method

The purposed-designed survey method was used in this study. The research instrument consisted of 40 open-ended and closed-ended questions distributed online using Google Forms. This instrument was developed to include five main components: the implementation of online and offline learning, Characteristics of Chemistry topics (reaction rate), Multiple Representations of Chemistry, social media needs, and their views and attitudes toward using social media as a medium for chemistry learning. The grid of instruments used is presented in Table 1. Respondents in the survey conducted were 76 Chemistry teachers and 109 Pre-service chemistry teachers. The demographic data of the respondents are shown in Table 2. The data obtained were analyzed using quantitative and qualitative data analysis techniques.

Table 1. Questionnaire 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		Eight questions (open and closed)
Total		40 Questions

Results and Discussion

In recent decades, the use of mobile technology has proliferated. This aligns with the development of social media, which offers new and efficient ways to communicate, collaborate, and build connections (Ruleman, 2012). The rapid development of information technology encourages social media assimilation into the academic world. Today's pedagogy stresses a student-centered learning approach and encourages cooperation rather than teacher-centered learning. By giving users distinctive methods to connect, interact, communicate,

and express themselves creatively with one another, social media that offer contemporary Internet resources have played a significant role in this stage of the transition process. Social media consists of various web-based tools that allow users to share ideas and new information in a more interactive virtual environment. This web-based tool encourages feedback as a crucial component of collaborative learning by acting as an essential channel for student contact and collaboration (Al-Khalifa and Garcia, 2013; Sarwar et al. 2019).

Table 2. Demographic data of chemistry teacher and Pre-service Chemistry Teacher

No		Demographic Data	Chemistry Teacher (%)	Pre-Service Chemistry Teacher (%)
1	Gender	Man	23.7	11
		Woman	76.8	89
2	School	Private	73.7	0
		Public	26.3	100
3	School Location	Central Java	94.7	86.2
		Other Provinces	5.3	13.8
4	Teaching experience	< 5 Years	5.3	-
		5 – 10 Years	14.5	-
		11 – 15 Years	14.5	-
		16 – 20 Years	25	-
		< 25 Years	40.8	-
5	Educational Background	S1	68.4	-
		Teacher Professional Education	2.6	-
		S2	28.9	-

Millions of people use social media platforms like Twitter, Facebook, and YouTube, and many incorporate these platforms into their daily lives. According to 2016 data estimation, 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 and Kazeem, 2016). Students spend significant time uploading, downloading, and viewing content on social media. Most students are always online, conversing with pals and watching movies. Some students have made social media sites a habit; they struggle to concentrate for an hour without checking into one of the sites and could be considered internet addicts (Osokoya and Kazeem, 2016).

The advantages of using social media are always overshadowed by the negative potential that may also impact students. In Fig.-1 to Fig.-4, data from this study's survey results are presented, revealing the views of chemistry teachers and pre-service chemistry teachers on the opportunities and challenges of using social media as a medium for chemistry learning. In addition, qualitative data from respondents' views are presented in Table 3.

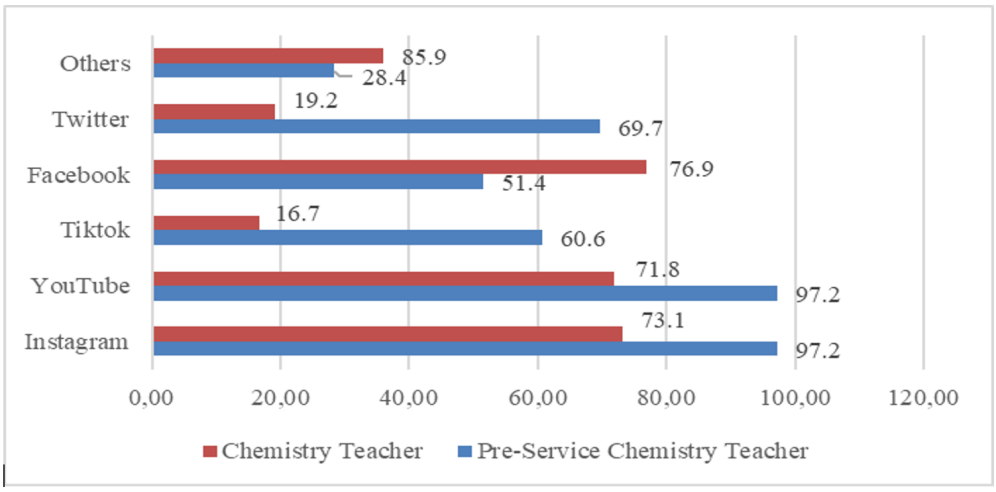

Fig.-1. Respondent's Social Media

Based on the data obtained from the survey results, it is known that during the Covid-19 pandemic, chemistry learning tends to be carried out using Blended Learning. This online and offline learning process

increases students' exposure to technology as a learning medium. Not only students but both teachers and pre-service teachers also have the same tendency. Moreover, teachers cannot avoid using digital technology as online and offline learning media. Therefore, digital literacy skills are necessary for teachers and students (Kartimi et al. 2021; Hirschprung et al. 2022).

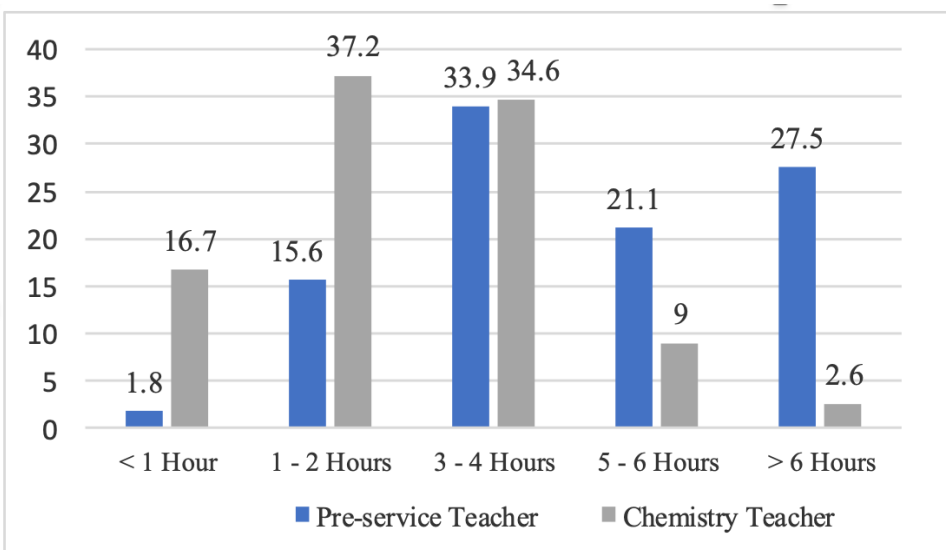

Fig.-2. Respondent Screen Time

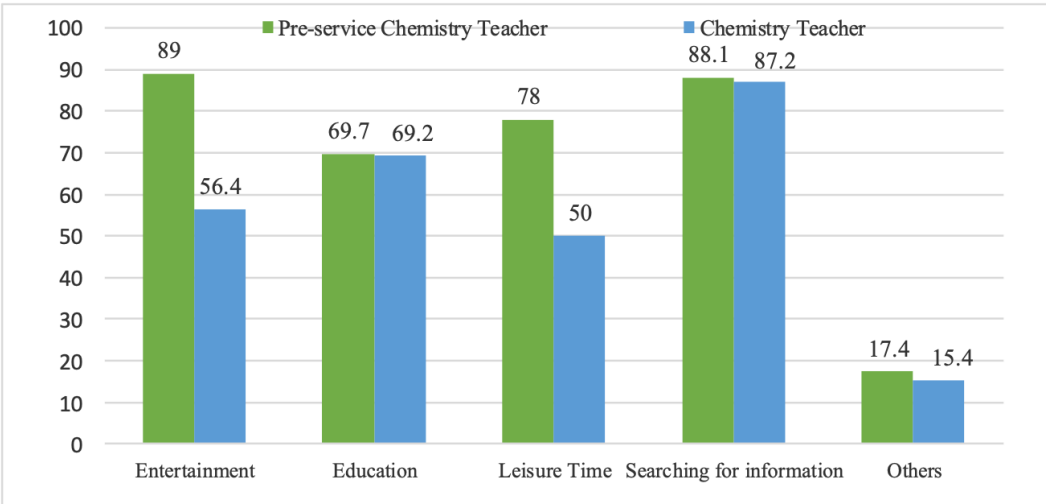

Fig.-3. Purpose of Using Social Media

Regarding the learning process, the Google Classroom Platform is the most frequently used digital platform. In addition, the lecture method still dominates the use of chemistry teachers to deliver learning materials. The data also show that teachers' and students' exposure to alternative learning media is still not varied. This is shown from the survey results on the use of learning media with the highest percentage of chemistry printed books, followed by YouTube and PowerPoint slides. In addition, the use of digital animation is still considered very minimal. This is a research opportunity to develop other learning media.

In terms of assessment during online learning, data obtained from teachers, pre-service chemistry teachers, and students consistently provide data that Google Forms is the most frequently used digital platform for assessments. In line with that, the form of multiple-choice questions is the most frequently used question. The lack of variations in the form of questions used can open up research opportunities for using other forms of questions in chemistry learning (Reeves and Kimbrough, 2004; Irby et al. 2018). Based on the survey results, both teachers, pre-service teachers, and students have social media. Instagram is a social media that is consistently owned by many teachers, pre-service teachers, and students. Meanwhile, Facebook is the most widely used social media by teachers, and students widely use YouTube and TikTok.

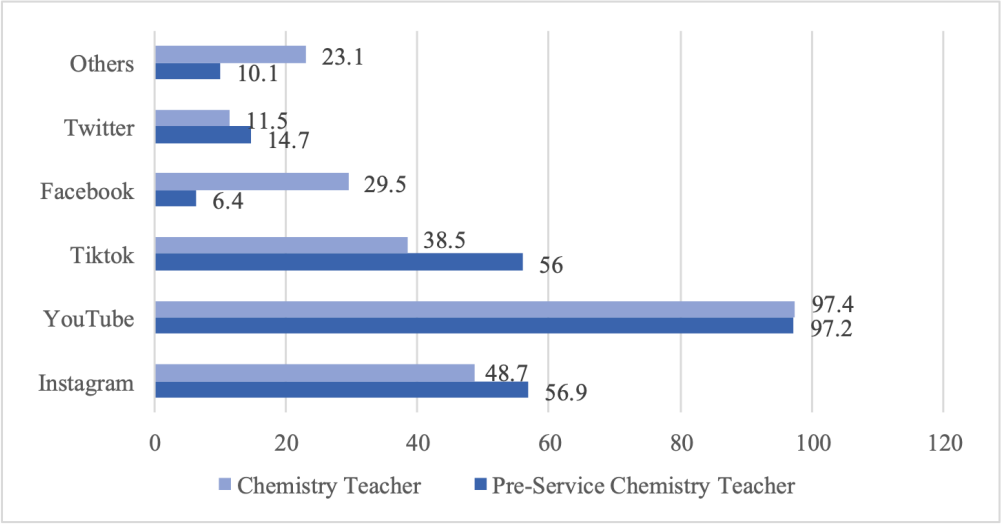

Fig.-4. Potential Learning Media

Table 3. Respondent's view

No	Questions	Chemistry Teacher	Pre-service Chemistry Teacher
1	In your opinion, what are the opportunities for using social media as a medium for learning chemistry?	1. Interactive and Interesting, and we can access various knowledge and information from YouTube and Google 2. Many students already use social media and may be more interested in learning with social media than the lecture method. 3. because by using social media in the delivery of learning materials, it will be possible for students to access the learning materials more often	1. The use of social media in chemistry learning can support online learning, where learning can be done and accessed anywhere and anytime by students 2. It is More exciting and more accessible to all students because most students have gadgets and social media. 3. Make the learning process easier. Through social media, students can actively be more creative and independent so that the quality of lessons can increase both knowledge and quality.
2	In your opinion, what are the challenges of using social media as a medium for chemistry learning?	1. Students are sometimes too engrossed in their social media that they forget about other assignments; besides that, some students are just scrolling 2. For students who have problems with cell phones, signals, internet quotas, it will be difficult to participate in learning activities 3. It is difficult to instil the character of life skills that require habituation	1. the challenge is when using social media; it requires a good and strong signal and the determination of students to use social media for learning. Because usually, they use social media more for entertainment. 2. The content must be engaging, mainly in its presentation. We cannot have many viewers if we do not follow the existing trend. For example, now, users prefer to see short videos on reels rather than photos with slides written on them. 3. It tends to be distracting; students want to scroll through social media unrelated to chemistry.
3	In your opinion, why is social media (can/cannot) used as a medium for chemistry learning?	Social media helps us in learning. It is interactive and attracts students' interest in learning. It is easy for students to understand because they are familiar with various social media, such as Facebook, Instagram, and TikTok.	It is undeniable that nowadays, social media is something that can be considered quite mandatory for someone to be able to communicate and share many things with other people. With this convenience, we can share academic knowledge with people out there so that social media can also be used as a medium for chemistry learning.

The use of social media for teachers, students, and pre-service chemistry teachers consistently has 3-4 hours. However, not a few respondents have more than 6 hours of social media usage time. From the time of exposure to social media, entertainment and seeking information were the main reasons the respondents used learning media. Not much use of social media for educational and learning purposes. With the intense use of social media from the majority of respondents and the purpose of use that has not yet led to education, it opens up opportunities for developing and using social media as a medium for chemistry learning (Junco, 2012; Tan, 2013; Hayes et al. 2020). Based on the survey results, it is recommended to develop social media-based learning media using the Instagram, TikTok, and YouTube platforms as an alternative development. Other recommendations, based on respondents' needs, contextualization of chemical concepts by using chemical representations are things that can be added to chemistry social media (Softic, 2012; Moghavvemi et al. 2018; Sarwar et al. 2019; Kong, 2022).

Conclusion

Based on the results of the survey conducted, it is known that during online and offline chemistry learning, respondents are accustomed to using YouTube as chemistry learning media. In addition, Instagram is the social media most widely owned by pre-service chemistry teachers, while Facebook is the social media most commonly owned by chemistry teachers. Other results reveal that most respondents have the same screen time, which is more than 4 hours daily. This screen time is used by respondents for entertainment and looking for news information on social media. With this long screen time that has not been used for the learning process, it can be a promising opportunity to use social media as chemistry learning media. This study is expected to be a reference for developing social media-based chemistry learning to increase student motivation and achievement.

Conflict of Interests

The author (s) declares that there is no conflict of interest in this research and manuscript.

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