Simple Additive Weighting Method to Assess the Impact of Social Media Usage on High School Students' Learning Concentration

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Abstract

This study aims to evaluate the impact of social media usage on the concentration levels of high school students by utilizing the Simple Additive Weighting (SAW) method as a decision-making tool. In this research, several important criteria are considered, including the duration of social media use, the frequency of accessing social media during study hours, the types of platforms most frequently used, and the academic performance of the students. These criteria are quantitatively measured and analyzed to assess how social media habits influence students' ability to maintain focus while studying. The SAW method is applied to process and weigh each criterion, allowing for a comprehensive assessment of the students' concentration levels. The findings of this study reveal that higher intensity in social media usage is associated with a noticeable decrease in students' concentration during learning activities. This suggests that excessive or poorly timed social media use may hinder academic focus and performance.By implementing the SAW method, this research provides an objective and data-driven basis for understanding the relationship between social media use and student concentration. The results can assist educators and policymakers in developing more effective teaching strategies and guidelines to help students manage their social media usage and improve their learning outcomes.

Keywords: *Students, Learning Performance, Social Media, Decision Support System, Simple Additive Weighting,*

1. Introduction

The development of communication technology has led to increasing knowledge about the impact of social media on the public. Indonesian education is closely related to the growth of social media, and as a result, social media is included in various educational initiatives. Authorities often use internet information systems that are open to classrooms and schools to collect and distribute information. At this point, anyone can easily access and use social media anytime, anywhere [1].

One of the users of social media is students. Social media for students is a place to get interesting information, as well as being part of a lifestyle. Many students do not want to be considered old-fashioned just because they do not have a social media account [2].

Social Media In the 5.0 era, there is a very close relationship with people, from children to adults. It is not uncommon for students to have social media accounts, because they are already proficient in using gadgets. However, this can lead to excessive use of social media in everyday life. Students who are too obsessed with social media can have an impact on their learning activities. They can become lazy to study and it will reduce their learning achievement [3].

In Indonesia, there are around 167 million (60.4%) of the total population of Indonesia as active social media users until January 2024, and WhatsApp (90.9%) is the most widely used social network, followed by Instagram (85.3%), Facebook (81.6%), Youtube (75%), Tiktok (73.5%) and Twitter (57.5%). Based on a study conducted by the Ministry of Communication and Information in collaboration with the United Nations International Children's Emergency Foundation (UNICEF), most social media users are students, aged between 18 and 25 years, it is proven that respondents who have used social media (96.25%), most respondents experience insomnia (86.25%), decreased learning motivation that affects learning outcomes (73.6%) [4].

Usually, students no longer enjoy the subjects they are studying, so they tend not to be involved in lessons and use social media as a source of entertainment if they feel stressed. All of this often happens, and students will experience a decline in academic achievement and personal growth. They cannot be separated from the influence of social media. The learning style of these students is different from previous students who did not have social interaction [1]. For example, now there are many cases related to defamation, insults, prostitution, kidnapping, and

intimidation that can cause depression in children. The ease of spreading information, both positive and negative, throughout the world will make children easily embarrassed, insecure and hurt. This phenomenon shows that internet users in Indonesia have not been able to use the internet properly and correctly. On the one hand, they can access the network, but on the other hand they still do not understand the consequences of using digital media. So, even though they have mastered reading and writing, internet users in Indonesia do not yet fully have digital literacy skills. [5].

One way to solve the available problems is to use a Decision Support System (DSS). A decision support system is an information system used to assist in decision making in an organization or company [6]. The method that will be used in this study is Simple Additive Weighting (SAW).

The SAW method was chosen because of its ability to evaluate criteria with a weighting process. The SAW method can perform multi-criteria evaluations by objectively comparing various alternatives and then providing recommendations based on the highest score obtained after going through the weighting and normalization process. Initially, this method will give weight to each attribute, then rank each of them until then choosing the best alternative based on the results obtained. The more data used will increase the accuracy of the results, so that the system provides the right recommendations. The conversion scale and weight preferences significantly affect the final ranking [7].

The advantage of the SAW method is that it can combine cost and benefit variables. The calculation time is very fast because it has included cost and benefit variables and the weight of the criteria has been determined in advance [8].

The use of the SAW method in the world of education is not the first time it has been done but has been done a lot, some of which are in 2020 Nadia Dwi Apriani, Novita Krisnawati and Yola Fitrisari in their research made "Implementation of Decision Support Systems with the SAW Method in Selecting the Best Teachers" and concluded that the SAW method is able to handle the problem of making decisions in selecting the best teachers [9]. And by Galih Surono and Nur Nawaningtyas Pusparini in 2020 in a study entitled "DECISION SUPPORT SYSTEM FOR DETERMINING EXEMPLARY STUDENTS USING THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD CASE STUDY: SD BHAKTI YKKP" and concluded that the SAW method can be applied to determine exemplary students by finding the best ranking from the weighting of the predetermined criteria [10].

2. Research Method

In accordance with the problem formulation, the framework is used as a guide in conducting this research described as follows
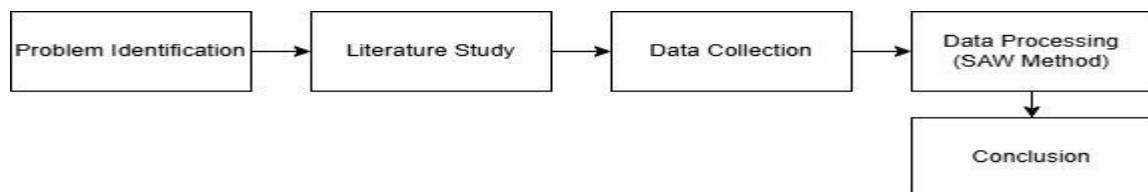

Fig. 1: Research methods

2.1. Problem identification

Excessive use of social media by high school students is thought to affect learning concentration. Therefore, this study applies the Simple Additive Weighting (SAW) method to assess the impact of social media use on students' learning concentration.

2.2. Literature study

Social media can have both positive and negative impacts on students. Several studies have shown a decrease in learning focus due to uncontrolled use of social media. The SAW method is used in decision making because it is simple and effective, and has been used in various educational fields, including student evaluation and achievement assessment.

2.3. Data Collection

Data were obtained through questionnaires distributed to high school students. The assessment criteria include: Frequency of social media use, Daily duration, Time of use, Impact on concentration. The data were then processed using the SAW method.

2.4. Data processing using the SAW Method

The data processing using the Simple Additive Weighting (SAW) method involves several steps to obtain the results. The steps are as follows Steps:
1. Determine criteria and weights
2. Compile a decision matrix
3. Normalize data
4. Calculate the final score by adding the results of multiplying the values and weights
Students with the highest scores are considered to have the least negative impact on concentration.

2.5. Conclusion

In the conclusion, the results obtained from this problem and the essence of what was obtained by conducting this research will be written.

3. Result and Discussion

The research on decision support systems to assess the impact of social media use on high school students' concentration in learning has the following research stages:

3.1. Determining Criteria Data

In this study, the Simple Additive Weighting (SAW) method was used to assess the impact of social media use on students' learning concentration. Before the SAW calculation process is carried out, an important initial step is to determine the criteria that will be used as the basis for the assessment.

Table 1: Criteria Data

Criteria Code	Criteria Name	Weight	Attribute
C1	Duration of social media use (hours/day)	0.25	Cost
C2	Frequency of distraction while studying (per day)	0.20	Cost
C3	Average academic grades (0–100)	0.25	Benefit
C4	Offline social interactions (score 1–5)	0.15	Benefit
C5	Student perceptions of AI (score 1–5)	0.15	Benefit

Criteria with the Cost type mean that smaller values are better (e.g. social media duration and frequency of interruptions), while the Benefit type mean that larger values are better (e.g. academic grades and social interactions).

3.2. Data Crips

Crips data is the initial or raw value of each alternative (in this case students) against each criterion before the normalization process is carried out. For example, the following are 5 student data that will be used for measurement.

Table 2: Data Crips

Student	C1 (Hours)	C2 (Times)	C3 (Grade)	C4 (Score 1-5)	C5 (Score 1-5)
Student A	3	5	80	4	3
Student B	2	3	85	3	4
Student C	4	6	78	5	2
Student D	1	2	90	4	5
Student E	3.5	4	82	3	3

3.3. Data Normalization

The next step in the SAW method is normalization, which is the process of changing the scale of the crips data so that it has a range of values between 0 and 1, so that it can be compared fairly between criteria. The normalization formula differs depending on the type of criteria:
Benefit:

$$R_{ij} = \frac{X_{ij}}{X_j^{\max}}$$

Cost :

$$R_{ij} = \frac{X_j^{\min}}{X_{ij}}$$

a.   Normalization of Attribute C1 – Social Media Usage Duration (Cost):

$$R_{C1} = \frac{1.0}{X_{C1}}$$

Table 3: Normalization of Attribute C1

Siswa	X (Hours)	R (Normalized)
A	3.0	1 / 3.0 = 0.333
B	2.0	1 / 2.0 = 0.500
C	4.0	1 / 4.0 = 0.250
D	1.0	1 / 1.0 = 1.000
E	3.5	1 / 3.5 = 0.286

b.   Normalization of Attribute C2 - Distractions While Studying (Cost)

$$R_{C2} = \frac{2}{X_{C2}}$$

Table 4: Normalization of Attribute C2

Student	X (frequency)	R (Normalized)
A	5	2 / 5 = 0.400
B	3	2 / 3 = 0.667

C	6	2 / 6 = 0.333	
D	2	2 / 2 = 1.000	
E	4	2 / 4 = 0.500	

c. Normalization of Attribute C3 – Academic Performance (Benefit)

$$R_{C3} = \frac{X_{C3}}{90}$$

Table 5: Normalization of Attribute C3

Student	X (grade)	R (Normalized)
A	80	80 / 90 = 0.889
B	85	85 / 90 = 0.944
C	78	78 / 90 = 0.867
D	90	90 / 90 = 1.000
E	82	82 / 90 = 0.911

d. Normalization of Attribute C4 – Offline Social Interaction (Benefit)

$$R_{C4} = \frac{X_{C4}}{5}$$

Table 6: Normalization of Attribute C4

Student	X (score)	R (Normalized)
A	4	4 / 5 = 0.800
B	3	3 / 5 = 0.600
C	5	5 / 5 = 1.000
D	4	4 / 5 = 0.800
E	3	3 / 5 = 0.600

e. Normalization of Attribute C5 – Learning Productivity (Benefit)

$$R_{C5} = \frac{X_{C5}}{5}$$

Table 7: Normalization of Attribute C5

Student	X (score)	R (Normalized)
A	3	3 / 5 = 0.600
B	4	4 / 5 = 0.800
C	2	2 / 5 = 0.400
D	5	5 / 5 = 1.000
E	3	3 / 5 = 0.600

f. Normalized Decision Matrix

Table 8: Normalization of Attribute C2

Student	C1	C2	C3	C4	C5
A	0.333	0.400	0.889	0.800	0.600
B	0.500	0.667	0.944	0.600	0.800
C	0.250	0.333	0.867	1.000	0.400
D	1.000	1.000	1.000	0.800	1.000
E	0.286	0.500	0.911	0.600	0.600

3.4. Weight Assignment and Final Preference Calculation

After normalization, the next step is to assign **weights** to each criterion. These weights represent the relative importance of each criterion in influencing students' learning concentration.

The weight vector is denoted as:

$$W = [w_1, w_2, w_3, w_4, w_5]$$

where:
- w_1: Weight for C1 (Social media usage duration)
- w_2: Weight for C2 (Frequency of distraction)
- w_3: Weight for C3 (Academic performance)
- w_4: Weight for C4 (Offline social interaction)
- w_5: Weight for C5 (Learning productivity)

The weights used in this example are:

Table 9: Weights example

Criterion	Weight
C1	0.20
C2	0.15

C3	0.30
C4	0.20
C5	0.15

SAW Final Score Formula:

$$V_i = \sum_{j=1}^{n} w_j \cdot R_{ij}$$

where:
- V_i: Final score for alternative i
- w_j: Weight for criterion j
- R_{ij}: Normalized value for alternative i on criterion j

Final Preference Value Calculations

Student A
$V_A = (0.20)(0.333)+(0.15)(0.400)+(0.30)(0.889)+(0.20)(0.800)+(0.15)(0.600)=0.643$

Student B
$V_B = (0.20)(0.500)+(0.15)(0.667)+(0.30)(0.944)+(0.20)(0.600)+(0.15)(0.800)=0.723$

Student C
$V_C = (0.20)(0.250)+(0.15)(0.333)+(0.30)(0.867)+(0.20)(1.000)+(0.15)(0.400)=0.620$

Student D
$V_D = (0.20)(1.000)+(0.15)(1.000)+(0.30)(1.000)+(0.20)(0.800)+(0.15)(1.000)=0.960$

Student E
$V_E = (0.20)(0.286)+(0.15)(0.500)+(0.30)(0.911)+(0.20)(0.600)+(0.15)(0.600)=0.616$

Table 10: Final Preference Scores and Ranking

Student	Final Score (V)	Rank
D	0.960	1
B	0.723	2
A	0.643	3
C	0.620	4
E	0.616	5

4. Conclusion

The application of the Simple Additive Weighting (SAW) method in this study has proven to be a reliable and structured approach to evaluating the influence of social media use and related factors on students' learning concentration. By identifying relevant criteria such as usage duration, distraction frequency, academic performance, social interaction, and productivity, the method facilitated a comprehensive and objective analysis.

Normalization of data and weighted scoring allowed for fair comparison across students with diverse characteristics. The results clearly identified student D as having the highest concentration level, while student E exhibited the lowest, reflecting the effectiveness of the model in ranking alternatives.

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