Impact of Communication Technology on Student Behavior During Lectures

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Abstract: *Technological advancements have impacted education, influencing student behavior across different eras—1990s, 2000s, and today. This survey-based research uses conventional sampling techniques and supports the theory of technological determinism, showing how communication technology affects behavior, thought patterns, and social interactions. Face-to-face communication has largely been replaced by online interactions. The study finds that chatting remains a common activity while waiting for lecturers, and highlights a decline in reading habits. Instead, frequent use of mobile phone has become prevalent. The research underscores how technology reshapes both learning environments and student habits.*

Keywords*: communication, lectures, online interaction, students, technological determinism theory*

Abstrak: *Perkembangan teknologi menyebabkan perubahan dalam berbagai aspek, termasuk dalam pendidikan. Penelitian ini dilakukan pada mahasiswa era 1990, era 2000, dan era saat ini. Penelitian ini menggunakan metode survei dengan teknik konvensional sampling. Hasil penelitian ini menegaskan teori determinisme teknologi bahwa perkembangan teknologi komunikasi dapat memengaruhi perilaku, pola pikir, dan interaksi sosial. Komunikasi tatap muka secara pribadi telah digantikan oleh komunikasi melalui internet. Penelitian ini juga membuktikan bahwa perilaku chatting masih menjadi perilaku komunikasi yang paling banyak digunakan ketika menunggu dosen hadir di kelas. Perkembangan teknologi membuat kebiasaan membaca mulai ditinggalkan sedangkan kebiasaan bermain handphone menjadi hal yang paling sering dilakukan.*

Kata Kunci*: interaksi online, komunikasi, mahasiswa, perkuliahan, teori determinisme teknologi*

The research aims to prove the theory of technological determinism from Marshall McLuhan. This theory states that technological development is a determinant of societal change (Kriyantono, 2019, p. 45). Carey (2009, p. 112) mentions McLuhan is figures who made the history of the mass media as the center of the history of civilization at large.

> This way of communicating results in a change in the way of human life, namely the communication media is the "essence of civilization are extensions of the human mind". (Littlejohn, Foss, & Oetzet, 2017, p. 278)

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According to McLuhan, the medium is the message, for instance the type of media itself (not including the type of message content) is a message that has an impact on society and the media is the extensions of human senses (media is an extension of the human senses). Newspapers are an extension of the eye, radio is an extension of hearing, and television is an extension of the senses of sight, hearing and touch (Littlejohn, Foss, & Oetzet, 2017, p. 278).

Newspapers have a visual bias (i.e. the prolongation of vision), which creates a perceptual system that is linear, sequential, tends to organize and arrange based on a certain order giving rise to individualism (Rakhmat, 2008, p. 248).

We read newspapers through a certain systematic pattern from left to right and then move down and start again from left to right so that it trains people to be rational, including the size of the profit and loss of everything. Oral media is biased towards sound (extension of sound), more free and random, more involving the element of emotion, not durable so it needs to be repeated, continuous interaction in the context of proximity or time binding so as to give birth to close social ties (Rakhmat, 2008, p. 248) or support community and relationship (Littlejohn, Foss, & Oetzet, 2017, p. 278).

Audiovisual radio and television actually emphasize oral culture (sound) over written or read culture. As a result, emotional, imaginative, and irrational elements are increasingly inherent in our society's thinking patterns.

Several previous studies have proven that technological developments affect behavior. Kriyantono et al. (2023, p. 144), in a national online survey of 624 students in Indonesia, found that students made social media the main source of information about Covid-19 compared to conventional mass media. Buchanan (2020, p. 1) found that false information is increasing and it is easier for people to spread such misinformation because social media has made it easier to spread through the features available in it. Chen, Chen, Pakpour, Griffiths, and Lin (2020, p. 1099) found that the use of new internet technologies has affected the psychological aspects of children. Although, the behavior of disseminating and searching for information has widely used the new technology of the internet, there are still many people who do not automatically trust the content of the information (Dubois, Minaeian, Paquet-Labelle, & Beaudry, 2020, p. 1).

In the 1990s, for example, mobile phone and internet technology were not widely circulated in the community. In the early 2000s, mobile phone technology had hit many people, however, it still did not have various features or applications. In the last decade, the development of mobile phone technology and the internet has advanced. It is interesting to explore whether there has been a change in student behavior due to the emergence of new technology as stated by McLuhan's technological determinism. Hence, the research evaluates whether this theory applies in the context of changing student behavior while waiting for the lecturer before the

lecture begins, whether the determination of communication technology impacts on students' behavior before the lecture starts, and the role of communication technology on student behaviour in searching for scientific reading literature.

Ontologically, technological determinism theory is a linear paradigm in communication science (West & Turner, 2010, p. 111). This linear paradigm is referred to as the process paradigm (Fiske, 2002), objective or scientist (Griffin, 2012; Littlejohn, Foss, & Oetzel, 2017; Kriyantono, 2019). Humans are considered passive and susceptible to receiving communication messages, and the communication process is considered a process of transfer (transmission), sending, extending the effect of messages, with the aim of controlling other parties. Communication is like giving an injection (Adler & Rodman, 2006, p. 12).

The purpose of controlling this is possible because human behavior is predictable as a result of constant or consistent characteristics over time that individuals do, for example if individuals read news about natural disasters in newspapers, they tend to feel sad (Kriyantono, 2019, p. 99). Communication resembles a mechanical process that transmits messages in one direction from the communicator through the media and received by the communicant so that the beginning and the end can be determined (as stated by Lasswell's formula: who says what in which channel to whom with what effect?). The message is also considered an entity that moves from one point to another until its final destination is received by the communicant. Communication is considered to run smoothly if the message is not lost or distorted due to interference, such us the message is received the same way it was delivered. The participants of communication are seen as static figures who only send and receive messages, without any social relations between them. The individual is seen as a separate unit of analysis from social relations. Human communication behavior is seen as a result of the influence of external forces on the individual and that influence can be identified (determinism).

The theory of technological determinism states that media technology determines the mindset, feelings, and behavior of individuals. In the end, media technology determines how societies operate when they are moving from one technological era to another (McLuhan, 1962). According to McLuhan (1962), each individual is considered to learn, feel, and behave due to the influence of messages received through available communication technologies. The characteristics of the communication media determine the type of senses that are stimulated. Radio requires one to only listen and develop the sense of hearing. Television engages our hearing and visual senses. Newspapers only stimulate the individual's sense of sight. The individual will transfer the developed senses into our daily lives and uses it continuously. The type of media becomes the message itself that influences the behavior of individuals.

The media have changed since the technology changes, so are the ways in which people communicate. People can only use the media for which it was created (phone to talk through the line or e-mail to talk through computer). If the medium is impersonal (television) then messages are also impersonal.

It is interesting to study whether this phenomenon also occurs today. Changes in communication media technology also occur in Indonesia. After newspapers, radio, television, and pagers, mobile phone technology began to develop in Indonesia. The development of the internet is also in line with the development of mobile phones. According to Yoshua (2022), the First Generation (1G) of mobile phone technology entered around the era of 1985 and continued to grow until around 1992. The technology used was called Nordic Mobile Telephone (NMT).

Around 1999, monophonic mobile phone began to circulate with Short Message Services (SMS) facilities. Various prepaid card products began to appear, such as Simpati from Telkomsel, Pro-XL from Excelcom, and Mentari from Satelindo. At the end of 1999, the number of mobile phone users in Indonesia reached 2.5 million subscribers, most of whom were users of prepaid services. Second Generation (2G) technology is limited to the ability to send picture messages Multimedia Messaging Service (MMS) by utilizing Global Packet Radio Services (GPRS) up to 50 kb/s. The need for greater data transmission prompted the birth of Third Generation (3G) technology in the early 2000s. This technology is also what makes video calls today possible. Smartphone technology, such as BlackBerry, iPhone, and Android are also starting to emerge and at the same time present a transition period to mobile phones with touch screens.

In 2014, the Fourth Generation (4G) mobile network with LTE (Long-Term Evolution) technology was present in Indonesia. The 4G network is increasingly supporting the performance of mobile internet services that were introduced during the 3G era. Popular mobile game services, including HD TV, Video Conference, 3D TV, and other features can be accessed on smartphones with superfast internet. The latest, Fifth Generation (5G) mobile network technology has been echoed in Indonesia since 2021. This technology provides faster data exchange services, with greater capacity and lower latency so that data transmission delays are minimized.

Based on the premise of the theory of technological determinism, it can be said that people's behavior will change as the communication technology changes. Student behavior will also change when they are waiting for the presence of the lecturer in the classroom. Before class starts, students usually come first and they wait for the arrival of their lecturer. This student's communication behavior is also influenced by technological developments. To understand this behavioral change, it is necessary to conduct research on the behavior of students in several eras. In this study, the authors compared student behavior in the

early 1990s, the 2000s decade, and students in the 2020s. The authors formulate the hypothesis that the communication behavior of students today is that they tend to use mobile phone as a communication medium while waiting for the arrival of the lecturer before the lecture takes place.

METHODS

This research used a survey method, a national survey, by distributing questionnaires to respondents. The questionnaire was distributed directly in print and online. Directly printed questionnaires were addressed to respondents who could be contacted directly. The online questionnaire (using G-Form) was intended for respondents who could not be visited directly and aimed to expand the number of respondents to a national scale.

This survey used conventional sampling technique, which is easy to select respondents (Kriyantono, 2020, p. 114). Questionnaires were distributed to willing respondents from various universities (current students of 2023) and respondents who had been students in the 1990s and 2000 to 2010. Thus, this survey has limitations on data generalization because it does not use sampling techniques that are representative of a number of certain propositions. It is hoped that a large number of respondents can reduce the limitations of generalization. The number of respondents taken is based on the principle of as many respondents as are willing to fill in. There were 832 respondents who filled out the questionnaire (670 current students, 63 respondents of 2000s students, and 67 respondents of 1990s students). The instrument was developed based on the purpose of the study, which was to prove the theory of Technological Determinism.

FINDINGS

In this section, the authors describe some important findings. There were 67 respondents who pursued undergraduate education in the 1990s with 26 women (38.8 percent) and men 41 (61.2 percent). Students who studied undergraduate education in the 1990s, when they became respondents today, 35 respondents (52.2 percent) still have a bachelor's degree, 18 masters (26.9 percent) and 14 doctorates (20.9 percent). The fields of knowledge possessed by the 1990s generation were religious sciences (one respondent/1.5 percent), natural sciences (18 respondents/26.9 percent), and 48 (71.6 percent) respondents came from social sciences and humanities.

Table 1 Data Respondents 1990 Era Who Pursued Undergraduate Education

Respondents 1990 Era	S1	S2	S3	Field
Men (61.2%)	52.2%	26.9%	20.9%	Religious sciences (1.5%)
				Natural sciences (26.9%)
Women (38.8%)				Social sciences and humanities (71.6%)

Source: Primary Data (2024)

The respondents were asked to name six habitual activities when they were waiting for their lecturer in class, before the lecture started. The most frequent activity carried out by respondents from the 1990s era group was chatting with fellow students while waiting for lecturers in lecture hours that had not yet begun. Out of 67 respondents, 59 respondents (88.1 percent) admitted that they chose to chat with fellow students. The second most common activity is sitting/hanging out in front of the classroom (35 respondents/52.5 percent). The next most frequent activities are reading lecture notebooks (28 respondents/41.8 percent). The next most frequent activity is reading textbooks or reference materials for lectures with a total of 23 respondents (34.3 percent). The next activity is drawing or doodling or writing on paper or other media with a total of 12 respondents (17.9 percent). The next most frequent activity is engrossed in eating and drinking (11 respondents/16.4 percent) and reading magazines or newspapers (nine respondents/13.4%).

The next activities are singing alone or imagining themselves silently (eight respondents/11.9 percent), not doing certain activities for example they choose to sleep or stay silent (seven respondents/10.4 percent), playing laptops (four respondents/6 percent), playing pager (three respondents/4.5 percent), and reading novels or comics (two respondents/3 percent). Meanwhile, one respondent (1.5 percent) chose other activities.

Table 2 Data Activities When They Were Waiting for the Lecture in Class 1990 Era

Activities When They Were Waiting for the Lecture in Class (1990 Era)	Percentage
Chat with fellow students	88.1%
Sitting/hanging out in front of the classroom	52.5%
Reading lecture notebooks	41.8%
Reading textbooks or reference materials for lectures	34.3%
Drawing or doodling or writing on paper pr other media	17.9%
Engrossed in eating and drinking	16.4%
Reading magazines or newspapers	13.4%
Singing alone or imagining themselves silently	11.9%
Not doing certain activities, they choose to sleep or stay silent	10.4%
Playing laptops	6%
Playing pager	4.5%
Reading novels or comics	3%
Other activities	1.5%

Source: Primary Data (2024)

Table 3 Data Activities They Most Often Did While Waiting for Lecturers to Arrive in Class

Activities They Most Often Did While Waiting for Lecturers to Arrive in Class (1990 Era)	Percentage
Chatting with fellow students	53.7%
Sitting around or hanging out in front of the classroom	14.9%
Reading lecture notebooks	10.4%
Reading textbooks and references to lecture materials	9%
Rawing, doodling and writing things on paper or other media	6%
Playing a pager	4.5%
Engrossed in eating and drinking	1.5%

Source: Primary Data (2024)

In addition to the above responses, respondents who studied undergraduate degrees in the 1990s were also asked to indicate the activities they most often did while waiting for lecturers to arrive in class. They usually do while waiting for lecturers to arrive in class, 36 out of 67 respondents (53.7 percent) chose chatting with fellow students as the most frequent activity. The second most common activity was sitting around or hanging out in front of the classroom, done by 10 respondents (14.9 percent). There were two activities that ranked third, namely reading lecture notebooks (seven respondents/10.4 percent) and reading textbooks and references to lecture materials which were each recognized by six respondents (9 percent). The next most frequent activity was drawing, doodling and writing things on paper or other media (four respondents/6 percent). The activity of playing a pager was chosen by three respondents (4.5 percent) and the activity of engrossed in eating and drinking was chosen by only one respondent (1.5 percent).

While studying at the undergraduate level in the 1990s, there were several reading sources or references that were most frequently used by respondents during their studies. There were 66 respondents (98.5 percent) who admitted to using textbooks or reference books as reading sources. Journals or seminar proceedings were used by 17 respondents (25.4 percent). Other reading sources were chosen by seven respondents (10.4 percent). From a total of 67 respondents, 65 (97 percent) respondents admitted to using textbooks or reference books as the main reading source and there were two respondents using the main reading source outside the book.

Regarding how to find reading resources, there were 40 respondents (59.7 percent) who claimed to come directly to the library. In other side, 18 respondents (26.9 percent) said they bought books and nine (13.4 percent) respondents mentioned that they usually borrowed books from friends.

Based on the data findings, it can be concluded that the use of communication technology was still not widely used by undergraduate students when waiting for lecturers before class starts. They mostly did interpersonal communication (chatting)

Table 4 Data Reading Sources or References That Were Most Frequently Used by Respondents

Reading Sources or References That Were Most Frequently Used by Respondents During Their studies (1990 era)	Percentage
Textbooks or reference books	98.5%
Journals or seminar proceedings	25.4%
Other reading sources	10.4%

Source: Primary Data (2024)

Table 5 Data Place to Finding Reading Sources

Place to Finding Reading Sources (1990 Era)	Percentage
Come to the library	59.7%
Buy a book	26.9%
Borrow books from friends	13.4%

Source: Primary Data (2024)

with fellow friends. The activity of reading books or lecture notes, which was quite a lot, shows that the activity of increasing the quality of knowledge was still widely found in 1990s students when waiting for the arrival of lecturers in class.

There were 66 respondents who were students in the early 2000 era, 29 men with percentage 43.9 percent and 37 women (56.06 percent). Of the 66 respondents, 33 respondents (50 percent) had a bachelor's degree at the time of completing the questionnaire, 31 respondents (47 percent) had a master's degree, and two respondents (3 percent) had a doctorate. Most respondents (65 people/98.5 percent) were from the social sciences and humanities and one respondent was from the religious sciences.

The usual communication activities of undergraduate students in the 2000 era were chatting with others (62 respondents/93.9 percent); playing mobile phone (35 respondents/53 percent); sitting around/ hanging out in front of the classroom (30 respondents/45.5 percent); playing laptop (18 respondents/27.3 percent); reading lecture notes (17 respondents/25. 8 percent); reading textbooks/reference books (13 respondents/19.7 percent); engrossed in eating and drinking (10 respondents/15.2 percent), which is the same number of respondents as reading novels and comics and doing no activity (sleeping or staying silent); reading magazines or newspaper (four respondents/6.1 percent), which is the same number of respondents as singing or imagining by yourself silently. There

Table 6 Data Respondents Who Pursued Undergraduate Education

Respondents 2000 Era	S1	S2	S3	Field
Women (56.06%)				Religious sciences (1.5%)
	33%	31%	3%	Natural sciences (0%)
Man (43.9%)				Social sciences and humanities (98.5%)

Source: Primary Data (2024)

Table 7 Data Activities When They Were Waiting for the Lecture in Class

Activities When They Were Waiting for the Lecture in Class (2000 Era)	Percentage
Chat with fellow students	93.9%
Playing mobile phone	53%
Sitting around/hanging out in front of the classroom	45.5%
Playing laptop	27.3%
Reading lecturer notes	25.8%
Reading textbooks/reference books	19.7%
Engrossed in eating and drinking	15.2%
Reading novels and comics	6.1%
Doing no activity	6.1%
Reading magazines or newspapers	6.1%
Singing or imagining by yourself silently	6.1%
Doing other activities	4.5%

Source: Primary Data (2024)

were three (4.5 percent) respondents who admitted to doing other activities.

From the overall answers above, when waiting for the lecturer's presence in undergraduate lectures, 43 respondents (65.2 percent) answered that the most frequent activity was chatting with fellow students. The next activities are playing mobile phone and sitting or hanging out in front of the class with each respondent nine respondents (13.6 percent). Two respondents (3 percent) read lecture notebooks and one person admitted that they were often engrossed in eating and drinking. Finally, there were two respondents who admitted to doing other activities.

When undergoing undergraduate education, respondents in the 2000 era already used mobile phone in their daily lives. Some respondents when using a mobile phone open several applications that are commonly used. Starting from the Instagram application which has the highest percentage, namely a total of 29 (43.9 percent) voter respondents. Followed by the use of Facebook and Line or WhatsApp applications with each application user as many as 27 respondents (40.9 percent). The next most frequently used application is the online news portal which is used to read online news selected by 26 respondents (39.4 percent). Furthermore, the most frequently opened applications when using mobile phone are playing games with a total of 17 respondents (25.8 percent), twitter and browsing or reading e-books or journals with 16 respondents (24.2 percent). The next most frequently opened applications are YouTube and others with a total of 14 respondents (22 percent).

Table 8 Data Activities When They Were Waiting for the Lecture's Presence in Class

Activities When Waiting for the Lecturer's Presence in Undergraduate Lectures (2000 Era)	Percentage
Chatting with fellow students	65.2%
Playing mobile phone	13.6%
Sitting or hanging out in front of the class	13.6%
Read lecture notebooks	3%
Engrossed in eating and drinking	3%

Source: Primary Data (2024)

Table 9 Data Activities When Using Mobile Phone in 2000 Era Daily Lives

Activities When Using Mobile Phone in 2000 Era Daily Lives	Percentage
Instagram	43.9%
Facebook	40.9%
Line	40.9%
WhatsApp	40.9%
Online news portal	39.4%
Playing games	25.8%
Reading e-book or journals	24.2%
Twitter	24.2%
YouTube	22%

Source: Primary Data (2024)

Table 10 Data Application When Using Mobile Phone in 2000 Era Daily Lives

Application That Are Usually Opened When Using A Mobile Phone (2000 Era)	Percentage
Facebook	18.8%
Instagram	16.7%
Other applications	15.2%
Games	12.1%
Online news	10.6%
WhatsApp	10.6%
Line	10.6%
Twitter	7.6%
TikTok	3%
YouTube	3%
E-book or journal	3%

Source: Primary Data (2024)

Of the several choices of applications that are usually opened when using a mobile phone, Facebook is the most frequently opened application when using a mobile phone with a total of 12 voters (18.8 percent). The next application that is opened while using a mobile phone is Instagram with a total of 11 respondents (16.7 percent). Next is other applications with a total of 10 respondents (15.2 percent). Then the most frequently opened applications are playing games with a total of 8 voter respondents (12.1 percent), reading online news and using line or WhatsApp, each with seven people (10.6 percent), and Twitter with a total of five voter respondents (7.6 percent). The last is the TikTok application, YouTube, and browsing or reading e-books or journals with each application selected by two respondents (3 percent).

Laptops are one of the important electronics used in the learning process. The generation who studied undergraduate education in the 2000 era used various features in the laptop. Most often, laptops are used for typing, for example assignments or activity reports. This can be seen from the 46 respondents (69.7 percent) who chose. Second, the laptop is used for browsing or reading e-books or journals with a total of 30 respondents (45.5 percent) voting. The next activity is a laptop used to play social media such as Facebook, Instagram, YouTube and others with a total of 27 respondents (40.9 percent). The next activity is playing games on a laptop with a

Table 11 Data Features Most Used in Laptop for Generation Early 2000 Era

Features Most Used in Laptop (2000 era)	Percentage
Used for typing, for example assignments or activity reports	69.7%
Used for browsing or reading e-books or journals	45.5%
Used to play social media such as Facebook, Instagram, Youtube and others	40.9%
Playing games on a laptop	18.2%
Opening WhatsApp	16.7%
Playing components other	13.6%

Source: Primary Data (2024)

total of 12 respondents (18.2 percent). Next is opening WhatsApp on a laptop with a total of 11 respondents (16.7 percent). The least common communication activity is playing components, namely a total of nine respondents (13.6%).

From the options described above, respondents chose the most important reference source used. The most frequently used by respondents who studied undergraduate education in the 2000 era was textbooks or reference books as their scientific reference source with a total of 42 respondents (63.6 percent). Next is a blog or website with a total of 12 respondents (18.2 percent). The next source of scientific reference is e-journals and e-proceedings which were chosen by five respondents (6.7 percent). The next sources used as references are journals and conference proceedings or seminars and e-books with three respondents (4.5 percent) voting for each. Other sources were the least selected component by respondents, totaling one person (1.5 percent).

In the generation who took undergraduate degrees in the 2000 era, the most common source of scientific references was by coming to the library directly. The majority of respondents chose to come directly to the library with 53 respondents (80.3 percent). The next source is through browsing and downloading from their own mobile phone or laptops with a total of 38 respondents (57.6 percent). The next source for finding scientific references is through buying it yourself with a total of 34 respondents (51.5 percent). Another source for obtaining reference sources is through borrowing friends, with a total of 30 respondents (45.5 percent). Furthermore, the source through the library website was chosen by 13 respondents (19.7 percent). The last source that was rarely chosen by respondents was finding reference sources through social media with 8 respondents (12.1 percent).

Table 12 Data Reference Source Used for Generation Early 2000 Era

Reference Source Used for Generation 2000 Era	Percentage
Textbooks or reference books	63.6%
Blog or website	18.2%
E-journals and e-proceedings	6.7%
Journals and conference proceedings	4.5%
Seminars and e-books	4.5%
Other sources	1.5%

Source: Primary Data (2024)

Table 13 Data The Most Common Source of Scientific Reference Used for Generation 2000 Era

The Most Common Source of Scientific References for Generation 2000 Era	Percentage
Come to the library directly	80.3%
Browsing and downloading from their own mobile phone or laptops	57.6%
Buying it	51.5%
Borrowing friends	45.5%
The library website	19.7%
Social media	12.1%

Source: Primary Data (2024)

Table 14 Data Respondents Early 2000 Era Who Pursued Undergraduate Education

Respondents Early 2000 Era	S1	S2	S3	Field
Women (57.08%)				Religious sciences (1%)
	94.6%	5.3%	0.14%	Natural sciences (11.7%)
Man (42.9%)				Social sciences and humanities (87.3%)

Source: Primary Data (2024)

There were 699 respondents, 300 males and 399 females, among students studying undergraduate education in the early 2020 era. Based on the finding, 82 respondents (11.7 percent) came from the natural sciences, seven respondents (1 percent) came from the religious sciences, and 610 people (87.3 percent) came from social sciences and humanities. Undergraduate students dominated with 661 people (94.6 percent), master's students numbered 37 people (5.3 percent), and one doctoral student (0.14 percent).

Students now also have a variety of habitual communication activities when waiting for lecturers in class. The six most frequent activities are playing with mobile phone (650 respondents/93 percent), chatting with fellow students with a total of 580 respondents (83 percent), engrossed in eating and drinking (211 respondents/30.2 percent), not doing certain activities (for example sleeping or staying silent) with a total of 181 respondents (25.9 percent), sitting/hanging out in front of the classroom (173 respondents/24.7 percent), and reading lecture notes with 170 respondents (24.3 percent). The next most frequent activities were singing to myself or imagining to myself with a total of 156 respondents (22.3 percent), reading textbooks/reference lecture materials (139 respondents/19.9 percent), drawing or doodling or writing on paper and other media (113 respondents/18.2 percent), playing laptop (110 respondents/17.7 percent). The next activity was reading novels or comics with a total of 58 respondents (8.3 percent), reading magazines or newspapers (one respondent/0.1 percent), and other activities also done by 16 respondents (2.2 percent).

Table 15 Data Activities When They Were Waiting for The Lecture in Class Early 2000 Era

Activities When Waiting for Lecturers in Class (Early 2000 Era)	Percentage
Playing with mobile phone	93%
Chatting with fellow students	83%
Engrossed in eating and drinking	30.2%
Not doing certain activities (for example, sleeping or staying silent)	25.9%
Sitting/hanging out in front of the classroom	24.7%
Reading lecture notes	24.3%
Singing to myself or imagining to myself	22.3%
Reading textbooks/reference lecture materials	19.9%
Drawing or doodling or writing on paper and other media	18.2%
Playing laptop	17.7%
Reading novels or comics	8.3%
Other activities	2.2%
Reading magazines or newspapers	0.1%

Source: Primary Data (2024)

Table 16 Data Activities When They Were Waiting for The Lecture Presence in Class for Current Student/ Early 2000 Era

Activities When Waiting for The Lecturer's Presence for Current Student	Percentage
Playing mobile phone	55.1%
Chatting with fellow students	31.8%
Singing to yourself or imagining to yourself	2.1%
Reading textbooks/reference materials	2%
Sitting around or hanging out in front of the classroom	1.9%
Reading lecture notebooks	1.7%
Did not do any special activity (i.e. sleeping or staying still)	1.4%
Playing with laptop	1.1%
Drawing or doodling or writing on paper or other media	0.9%
Reading novels or comics	0.7%
Engrossed in eating and drinking	0.7%
Other activities	0.4%
Reading magazines or newspapers	0.1%

Source: Primary Data (2024)

The most frequent activity carried out by undergraduate students today (early 2020 era) is playing mobile phone (389 respondents/55.1 percent). The second most frequent activity is chatting with fellow students (222 respondents/31.8 percent). Singing to yourself or imagining to yourself was the number one activity done by 15 respondents (2.1 percent). Reading textbooks/reference materials was only chosen by 14 respondents (2 percent) as the most frequent activity, slightly above reading lecture notebooks (two respondents/1.7 percent). This notebook reading activity is still inferior to Sitting around or hanging out in front of the classroom, which is most often done by 13 respondents (1.9 percent).

There were 10 respondents (1.4 percent) who stated that they did not do any special activity (i.e. sleeping or staying still), followed by playing with laptop with eight respondents (1.1 percent), drawing or doodling or writing on paper or other media with six respondents (0.9 percent), reading novels or comics and engrossed in eating and drinking with five respondents (0.7 percent). The bottom two most frequent activities were other activities (three respondents/0.4 percent)

Table 17 Data Most Frequently Opened Application When Use Mobile Phone Early 2000 Era

Most Frequently Opened Application When Use Mobile Phone (Early 2000 Era)	Percentage
Instagram	53.6%
Line	39.1%
WhatsApp	39.1%
TikTok	34%
Games	11.3%
YouTube	10.2%
Twitter	7.6%
Online news	3.7%
E-book	3.3%

Source: Primary Data (2024)

and reading magazines or newspapers (one respondent/0.1 percent).

Regarding the use of mobile phones, the most frequently opened application is Instagram (289 respondents/53.6 percent). Followed by the use of Line or WhatsApp applications totalling 211 respondents (39.1 percent). Furthermore, 183 respondents (34%) used the Tik Tok application. The next applications are games (61 respondents/11.3 percent), Youtube (55 respondents/10.2 percent), Twitter (41 respondents/7.6 percent), reading online news (20 respondents/3.7 percent), and browsing and reading e-books (18 respondents (3.3 percent).

Facebook was only chosen by 10 respondents (1.9 percent) as the most frequently used application while waiting for the lecturer's arrival in class. Other applications outside of all the above applications have been selected by six respondents (1.1 percent) as the most frequently used applications.

Laptops are one of the important electronic devices used in the learning process. The generation who studied undergraduate education in the early 2020 era used various features in the laptop. Most often, laptops are used for typing assignments or activity reports. This was recognized by 410 respondents (58.7 percent). Browsing or reading e-books or journals was the most frequently done when using a laptop by 85 respondents (12.2 percent). Furthermore, opening Whatsapp as the third most frequent activity done with a laptop while waiting for the lecturer's presence in class (50 respondents/7.2 percent). There were 37 respondents (5.3 percent) who claimed to also play games on laptops as the most frequent activity. Lastly, other activities were also the most frequently done while waiting for lecturers by 21 respondents (3 percent).

The data shows that students now mostly use blogs or websites as their main

Table 18 Data Features Most Used in Laptop Early 2000 era

Features Most Used in Laptop (Early 2000 Era)	Percentage
Used for typing, for example assignments or activity reports	58.7%
Used for browsing or reading e-books or journals	12.2%
Opening WhatsApp	7.2%
Playing games on a laptop	5.3%
Other activity	3%

Source: Primary Data (2024)

Table 19 Data Features Most Used Reading Sources Early 2000 Era

Mostly Use Reading Sources for Early 2000 Era	Percentage
Blogs or website	61.9%
Textbook or reference book	60.5%
E-book	58.2%
E-journals and e-proceedings of conferences or seminars	51.8%
Printed journals and proceedings	36.8%
Other	1.1%

Source: Primary Data (2024)

reading source. There are 433 respondents (61.9 percent) who admit it. Textbook or reference book is still the most important reference source by 423 respondents (60.5 percent). E-books were chosen by 407 respondents (58.2 percent) as the main source of reference. The next source of scientific reference is through e-journals and e-proceedings of conferences or seminars which are used as the main reading source by 362 respondents (51.8 percent) while printed journals and proceedings are used as the main reading source by 257 respondents (36.8 percent). Finally, there were 8 respondents (1.1 percent) who used other as their main reference source.

The number of reading sources originating from blogs or website seems to correlate with respondents recognition that they most often look for reading sources or reference sources and downloading from their own mobile phone or laptops (641 respondents or 91.7 percent). Related to the internet, social media and library websites were the most frequently used channels by 307 respondents (43.9 percent) and 177 respondents (25.3 percent) respectively. There were 165 respondents (23.6 percent) who claimed to buy their own reading resources and borrow reading materials from friends (154 respondents/22 percent). Few respondents chose to come directly to the library to find reading resources (141 respondents/20.2 percent).

DISCUSSIONS

The theory of technological determinism developed by Marshall McLuhan (1962) has stated that humans will not be separated from technological

Table 20 Data Most Used Reading Sources from Mobile Phone or Laptop Early 2000 Era

Mostly Use Reading Sources by Browsing from Mobile Phone or Laptop for Early 2000 Era	Percentage
Blogs or website	91.7%
Social media	43.9%
Library website	25.3%
Buy their own	23.6%
Borrow from friends	22%
Come directly to the library	20.2%

Source: Primary Data (2024)

Table 21 Comparison of Communication Behavior Between Generations

Students of The 1990 Era	Students of The 2000 Era	Current Students
1. Chatting with fellow students.	Chatting with others	Playing mobile phone
2. Sitting/hanging out in front of the classroom	Playing mobile phone	Chatting with others
3. Reading lecture notebooks	Sitting around/hanging out in front of the classroom	Engrossed in eating and drinking
4. Reading texbooks	Playing laptop	Not doing certain activities (for example, sleeping or staying silent)
5. Drawing or doodling or writing on paper or other media	Reading lecture notes	Sitting around/hanging out in front of the classroom

Source: Primary Data (2024)

development. The presence of technology certainly serves to help facilitate human life. Humans have the ability to develop technology. Technology will shape how people think, behave in a society.

In the field of communication, for example, today's society is increasingly helped by the ease of getting information quickly, simultaneously, and covering unlimited information areas throughout the world (Amodu, Omojola, Okorie, Adeyeye, & Adesina, 2019; Yap, Tiew, Ngadan, & Ho, 2020). Communication technologies make it easier for people to search, obtain and disseminate information (Buchanan, 2020; Kriyantono et al., 2023). However, new communication technologies can also cause psychological disorders in children (Chen, Chen, Pakpour, Griffiths, & Lin, 2020). The condition of the world seems to break a saying in Indonesian society that the world is not as wide as a moringa leaf. With technology, the world seems to narrow and there is no distance limit because all events in various parts of the world can be spread quickly. This is also in line with another concept from McLuhan that the world is a global village.

The data findings further prove that no human group can be separated from technology. In other words, the data findings further prove the premise of the theory of technological determinism that the development of communication technology affects human communication behavior. Communication technology further reduces dependence on direct face-to-face communication. It is possible for people to communicate using certain channels without physically meeting. This dependence on direct face-to-face communication is further reduced by the presence of internet technology. The internet is able to combine direct face-to-face communication and mass communication (Hinson, Kosiba, Odoom, & Gyampo, 2019, p. 568). This hybrid capability makes the internet easier to fulfil human communication needs. The internet allows people to meet face-to-face without having to meet physically.

The development of the internet has increased dramatically in the era of the early 2000s decade until it continues to grow today. Coupled with the ability to combine face-to-face communication and mass communication, the internet is the main choice for respondents today. Communication behavior has also increased because the internet can be used easily and the potential for disturbing the comfort of others is also small. One can use the internet (via mobile phone or laptop) without making noise that disturbs others. Communication via the internet is also faster, can reach a wide audience in a short time and can provide a very large alternative choice of messages. For example, students can get a choice of various types of reference sources in a short time.

This capacity of the internet makes people less likely to come directly to the library to borrow books. The data shows that respondents are more likely to look for scientific reference sources by browsing the internet freely. Libraries are still widely

used to find reference sources by visiting internet facilities, namely library websites, without coming directly to the library building.

This research confirms the premise of the theory of technological determinism that technological developments affect respondents behavior. Technology is able to extend human senses, that is, humans are able to communicate with many people, in a wider area, in a shorter time. Media is an extension of human senses (Littlejohn, Foss,& Oetzel, 2017).

While in the classroom and waiting for the lecturer to enter the class, students in the 1990s mostly chatted face-to-face with fellow students. This habit is also carried out by students in the early 2000s although with a lower percentage. In contrast to the habits of students in the current era (2020s) waiting for lecturers in class by playing mobile phone. Mobile phone enable chatting activities through chat applications, both on Facebook, Instagram, and WhatsApp. The data findings show that the use of these applications is a choice that is often used by students in this era. According to Table 1, chatting is still a habit often done when technology has not and has developed towards digital. Before technology developed, chatting was done face-to-face and done via internet applications when technology has developed. On the other hand, a habit that is rarely practiced is reading. The habit of reading is not among the top five activities of waiting for lecturers in class in today's students.

New media, such as social media, should be used for science communication (Sugiono, 2023, p. 97) which can be used as an important reference source for students. In addition to the fact that mobile phone is now a polymedia for getting information (Brodjonegoro, 2023, p. 117). Students must be encouraged to have the habit of reading scientific references on the internet via mobile phone because during the Covid-19 pandemic, online learning has become an important alternative and encourages students to actively search for scientific references online (Alshahrani, Ahmed, & Ward, 2017). The future education system is predicted to use more distance education (Afrilyasanti & Basthomi, 2022, p. 594).

Digital technology can create digitalization of chat or online *cangkrukan*, which is personal communication from face-to-face to face-to-face in cyberspace. Because the internet allows communication to take place quickly and without physical boundaries, geographical boundaries, and without user boundaries (anyone can use), cyberspace communication has increased chat communication events. In addition, chatting is also easier because cultural barriers, psychological barriers are diminishing, and tend to be impersonal. Digital technology ultimately allows individuals to have extensive networking networks, making it easier to share scientific information quickly (Pérez-López et al., 2020, p. 132).

For students in the 1990s, mobile phones were not yet a ubiquitous technology, unlike the generation of the

2000s and 2020s who used mobile phones as a tool to obtain information sources. Facebook is the application most frequently accessed by students in the early 2000s while current students use Instagram as the most frequently accessed application. In other words, the hypothesis can be accepted that the communication behavior of students today is that they tend to use mobile phone as a communication medium while waiting for the arrival of the lecturer before the lecture takes place.

Laptop is one of the important electronics used in the learning process besides mobile phone. In 1990s students, laptops are still electronics that are rarely encountered while students in the 2000s and 2020s, laptops are quite familiar components that are often used in the learning process. Laptops offer various features and facilities in supporting the learning process. In the generation who took undergraduate education in the early 2000s and 2020s, students often used laptops for typing, such as assignments or reports.

Apart from using electronic media to obtain academic reference sources. Students can also obtain reading or reference sources. In the 1990s students obtained reading sources or references through textbooks. While other sources are least often used to obtain reading sources. Students in the early 2000s most often used textbooks or reference books as their scientific reference sources, while other sources were also very rarely used to find reading sources. Students of the current era mostly use blogs or websites as their reading sources. Meanwhile, other sources are rarely used.

There are several places that can be used to obtain academic reference sources. Students in the 1990s and early 2000s made the library the main place to obtain reference sources. Unlike today's students who mostly utilize browsing and downloading features from their own mobile phones or laptops to obtain reference sources. Interestingly, social media is not used at all to find scientific reference sources. In today's students, borrowing books from friends is very rarely chosen to obtain information sources.

CONCLUSION

This research confirms the theory of technological determinism that the development of communication technology can affect behavior and social interaction. Face-to-face personal communication has been replaced by communication using the internet.

This study also proves that chatting behavior is still the most widely used communication behavior when waiting for the lecturer to attend class. The development of technology makes reading habits begin to be abandoned while the habit of playing mobile phone becomes the most frequent.

This study has limitations related to data generalization because it uses convenience sampling which is chosen for convenience. Even with a large sample size, the distribution of samples between categories of student eras is not the same. However, the results of this study can be used as an initial study to understand behavioral trends due to technological developments.

For further research, the authors recommend conducting qualitative studies for a more in-depth exploration of behavior. In addition to interviews to unravel behavioral motives, observations can also be used to capture behavior in natural settings.

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