ISSN 2355-4185(p), 2548-8546(e)
DOI: 10.24815/jdm.v8i2.21367

Profile of Student Academic Procrastination Behavior in Problem Solving and Mathematical Digital Literacy

Aidha Rosalia Agustin[1], Widodo Winarso[2*]

[1,2]Mathematics Education Department, IAIN Syekh Nurjati Cirebon, Indonesia
*Email: *widodoiain@gmail.com*

Received: 16 July 2021 ; Revised: 6 August 2021 ; Accepted: 5 September 2021

Abstract. *The phenomenon of procrastination behavior in problem-solving and mathematical digital literacy still occurs among students. This study aimed to analyze the profile of students' academic procrastination behavior in problem-solving and mathematical digital literacy-purposive sampling technique involving 19 students of one junior high school in Indonesia. Academic procrastination behavior is obtained through qualitative research with a case study approach using the Tuckman Procrastination Scale (TPS) instrument, digital literacy scale, mathematical problem-solving ability tests, and semi-structured interviews as well as data analysis with four steps of research, namely data collection, data reduction, data presentation, and concluding. Most of the students (84.2%) experienced academic procrastination in solving mathematical problems and mathematical digital literacy (21%). There are six kinds of problem-solving and mathematical digital literacy student profiles in the high, moderate, and low category.*

Keywords*: academic procrastination, digital literacy, solution to problem, mathematic*

Introduction

In mathematics, the quality of learning can be seen from the increase in mathematical problem-solving abilities. The students are said to have high problem-solving skills when students can understand and explore problems, determine strategies for problem-solving, use selected strategies for problem-solving, and look back at the results obtained from the problem-solving process (Montague & Applegate, 2000).

Not only problem-solving skills, in learning mathematics, requires skills in digital literacy. Research conducted by Judge (2005) shows that one aspect that also influences student problem-solving skills is digital literacy skills. There is a correlation between digital literacy and student learning outcomes (Claro, Cabello, San Martín & Nussbaum, 2015). Students with High digital literacy skills tend to have high learning outcomes (Hu, Gong, Lai & Leung, 2018). On the other hand, students with low digital literacy skills have low learning outcomes (Sarkar, Mohapatra & Sundarakrishnan, 2017).

Digital literacy is a process in several activities using digital devices in operating, sorting, developing creativity, and establishing communication related information while still providing the main point of attention to the safety of operating digital devices (Hague & Payton, 2010). An indication that a student has high digital literacy skills is shown if the student has four abilities. These abilities are attitudes statements, technical dimensions, cognitive dimensions,

and social-emotional dimensions (Ng, 2012). Mathematical digital literacy is the ability to understand and use information related to mathematical material in various formats from various sources that are presented through computers and especially through internet media (Kilpatrick, 2001). According to Jablonka (2003), mathematical digital literacy is a constellation of knowledge, skills, and competencies mathematics needed to thrive in a learning culture dominated by technology. So that the application of mathematical digital literacy provides opportunities for interaction, literacy of interesting reading sources, various reference materials, communication, and problem-solving (Kissane, 2009).

Contrary to what should have happened, the phenomena in the field show that difficult and scary are still he identity of mathematics. The anxiety and fear is still experienced by students when facing mathematics lessons. The phenomenon in the field shows that students have low digital literacy skills in math (Zulkarnain, Heleni & Thahir, 2020). This is indicated by the widespread consumption of violent shows, pornography, and hoaxes among students. The low level of students' mathematical digital literacy is also shown in the survey. In the 2018 PISA results, Indonesia is ranked 73rd Economic Co-operation and Development) survey. In the 2018 PISA results, Indonesia is ranked 73rd.

Students prefer to spend their time on things that are not useful, either in the form of just using a device to play games or going out with their friends (Nordby, Løkken & Pfuhl, 2019). The number of useless activities carried out by students has an impact on impacts neglected school assignments because learning is no longer the main priority (Asri, Setyosari, Hitipeuw & Chusniyah, 2017). The emergence of student behavior in the form of procrastination in completing the given task is one of the impacts of the inability of students to manifest their mathematic problem solving through the completeness of the work given (Kim, & Seo, 2015). The existence of wrong perception and environment is also part of his inability (Yilmaz, 2017). This kind of behavior is known as procrastination.

Procrastination is a symptom in complex psychology. This is then described as the behavior of carrying out delays in starting or completing tasks (Freeman, Cox-Fuenzalida & Stoltenberg, 2011). Facts on the ground show that academic procrastination is the root of dishonesty among students in completing assigned tasks. Based on observations made to several students of SMPN 1 Talun-Indonesia, 80% of students showed a tendency to procrastinate behavior. This is indicated by students who delay doing the assigned tasks, then cheat on their friends when the time for doing the assignments is almost up.

Several studies show that students often do procrastinate. 60% of students have a habit of procrastinating in their daily lives (Milgram, Mey-Tal, & Levison, 1998). In education, students carry more than 70% of procrastination in academic tasks (Çapan, 2010). Indications of students

experiencing procrastination behavior are the tendency to delay doing something (time waster), the tendency to experience delays if they have difficulty doing unpleasant things (task avoidance), and the tendency to blame others for their own mistakes (blaming others) (Tuckman, 1991).

Procrastination is a fairly complex negative thing, especially in learning mathematics. Students must have a continuous understanding construction so that it is easy to decide which alternative methods will be used in solving mathematical problems. Procrastination contribute to learning achievement. Procrastination correlates with learning achievement in mathematics. Students with low procrastination have better mathematics achievement than students with moderate and high procrastination (Akinsola, Tella & Tella, 2007). Balkis and Erdinç (2017) stated that procrastination influences academic performance and academic satisfaction. Students with low procrastination have high academic performance and academic satisfaction.

The studies that corroborate this are research related to indications of academic procrastination. Perfectionism influences problem-solving abilities (Chen, Hewitt, Flynn, Ko & Flett, 2020). Anxiety correlates with mathematical problem-solving abilities (Zhang, Zhao & Kong, 2019), and self-confidence correlates with problem-solving abilities (Kim & Kim, 2016). This shows that there is a correlation between mathematical problem-solving ability and academic procrastination.

Research on problem-solving abilities and digital literacy research also shows a correlation between digital literacy and academic procrastination. Academic procrastination and digital literacy have a negative correlation. When digital literacy competence increases, the level of procrastination decreases, or in other words, when students have high digital literacy competence, students have low levels of procrastination (Kosycheva, Tuzhba, Gaydamashko, & Yesaulova, 2020). This shows that there is a correlation between academic procrastination and digital literacy. Based on studies related to the correlation between academic procrastination and problem-solving and academic procrastination with digital literacy.

There is no research that discusses the relationship between academic procrastination, problem-solving skills, and mathematical digital literacy. The research discussed is still around the correlation of procrastination with digital literacy. Based on the above phenomena, researchers are interested in taking a common thread from previous studies. The researcher wants to know the real condition of students' academic procrastination in problem-solving, academic procrastination in mathematical digital literacy, and the factors that cause academic procrastination behavior, scientifically and systematically. By doing this research, it is hoped that it can help educators recognize, overcome, and even further anticipate students' procrastination attitudes by providing appropriate treatment to minimize problems in learning,

especially mathematics. With adequate knowledge about these matters, it is hoped that future learning can be more optimal and produce higher-quality outputs. The research questions in this study are 1) how is the student's academic procrastination on mathematical problem-solving ability? 2) how is the student's academic procrastination on mathematical digital literacy skills?, and 3) what are the factors behind students doing academic procrastination in problem solving and mathematical digital literacy?

Method

This research is qualitative research with a case study approach. According to Creswell and Creswell (2017), a case study is a qualitative approach that examines a phenomenon appointed as the focus of research to be studied in depth. The design of this case study is an integrative and comprehensive approach using an in-depth examination of a phenomenon experienced by students (Paley, 2016). In this case, the phenomenon in question is the tendency of academic procrastination behavior. This research approach aims to get an overview and explain in-depth the real condition of student academic procrastination in problem-solving and digital literacy using this research design.

The subjects of this study were students of class VIII in one junior high school in Cirebon, Indonesia, totaling 19 students. Determination of research subjects selected by purposive sampling technique through three stages. The first stage is the distribution of the digital literacy scale and problem-solving ability tests. The second stage is the dissemination of the academic procrastination scale, and the third stage interviews.

Instruments

The instruments used in this research are the problem-solving ability test, digital literacy scale, academic procrastination scale, and semi-structured interviews. According to Polya, the problem-solving ability test used in this study consisted of four valid and reliable questions made by researchers with reference to the dimensions of problem-solving strategies (Daulay, & Ruhaimah, 2019; Schoenfeld, 1987; Tohir, 2018). In the problem-solving test, presented in Table 1.

Table 1. Dimension of problem solving skill

Instrument	Dimension	No item
Problem solving skill	Understanding and exploring problems	1
	Finding strategy	2
	Using strategies to solve problems	3
	Looking back	4

The question that are used a s a test of problem solving abilities are:

1. To decorate the entire surface of her room measuring $5m \times 4m \times 3m$. Dinda needs $94m^2$ wallpaper. Based on the statement, mention the elements that are known from the statements presented!
2. It is known that an object in the shape of a cube has a side length of $12cm$. How do you find the surface area of the cube?
3. An object in the shape of a cube has a surface area of $384cm^2$. What is the length of the side of the cube?
4. A cuboid of length $8cm$, widht $4cm$, and height $5cm$ has a surface area of $136cm^2$. Based on your checking whether the statement is true

The digital literacy scale used in this study is a scale adapted from Wan Ng (2012) with four measurement dimensions totaling 17 statements and four point likert scale, namely always, often, rarely, never. The four dimensions of measurement in the scale are attitude statements, technical dimensions, cognitive dimensions, and social-emotional dimensions (Ng, 2012; Hague & Payton, 2010). The digital literacy scale through the following Table 2.

Table 2. Dimension of digital literacy

Instrument	Dimension	No item
Digital Literacy	Attitude statement	1, 2, 3, 4, 6, 13, 14
	Technical dimension	7, 8, 9, 10, 11, 16
	Cognitive dimensions	12, 17
	Social-emotional dimensions	5, 15

The problem-solving ability test and digital literacy scale were distributed to all research subjects, namely 19 students. Students who cannot solve problems consist of 16 students, this can be seen from the students' inability to answer the questions presented in the problem solving test. Students who are not capable of digital mathematical literacy consist of 4 students, this can be seen from the filling of the digital literacy scale by students. On the scale, the student stated that he did not have the ability in the digital literacy dimension. Student who are not capable of problem solving and digital literacy are then asked to fill out an academic procrastination scale. The academic procrastination scale used in this study is a scale adapted from Bruce W. Tuckman's TPS (Tuckman Procrastination Scale) with three measurement dimensions totaling 15 statements and four answer choices, namely always, often, rarely, never. The three dimensions are time-wasting, task avoidance, and blaming others (Pinxten, De Laet, Van Soom, Peeters & Langie, 2019: Yockey, 2016). The academic procrastination scale as follows Table 3.

Based on the data obtained, 16 students who experienced academic procrastination were interviewed regarding the factors behind the academic procrastination behavior. Before data analysis, the instrument analysis was first carried out on the mathematical digital literacy scale and the academic procrastination scale by testing the validity of the language with Aiken's V.

The problem-solving ability tests were tested for validity, reliability, level of difficulty, and discrimination power. As a result, the instruments used in this study have been tested and declared valid and reliable with the value of validity on each problem solving ability test question sequentially as follows 0.795, 0.796, 0.859, and 0.834. The reliability value of the test is 0.821.

Table 3. Dimension of academic procrastination

Instrument	Dimension	No Item	
		Favorite	Unfavorable
Academic Procrastination	Time waster	1, 3, 10, 15	11, 12
	Task avoidance	2, 8, 9, 13	5, 7
	Blaming others	4, 6, 14	

Data Analysis

Data analysis was carried out using the Miles and Huberman technique, consisting of data collection, data reduction, data presentation, and concluding (Kawulich, 2004). To find out the validity of the data obtained, a triangulation technique of data sources was used in this study. Data collection was carried out by distributing problem-solving ability tests, digital literacy scales, academic procrastination scales, and conducting interviews after data collection, coding, or providing identity for each existing data. The researcher gave a code with the identity of Subject 1, Subject 2, and so on. The researcher then selects valid and accurate data and discards data that cannot be used. After performing data reduction, the researcher classified the data and presented it in graphs and tables along with information about the number and percentage of students who experienced it, which was then narrated. After that, the researchers concluded by considering the findings related to procrastination in problem-solving, procrastination in digital literacy, and the factors that influence students in academic procrastination, which was then narrated in paragraph form.

Results and Discussion

The research conducted examines three things. The three things studied in this study are students' academic procrastination behavior in solving math problems, the tendency of students' academic procrastination behavior in mathematical digital literacy, and the factors behind students' academic procrastination behavior in problem-solving and digital math literacy. Therefore, Therefore, this research study be presented as follows.

Students' Academic Procrastination Behavior in Mathematical Problem Solving

Based on the research, by conducting a mathematical problem-solving ability test, the results of the categorization of mathematical problem-solving ability test scores were obtained as follows:

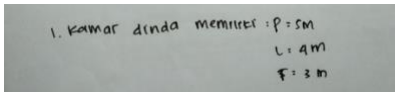
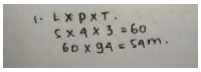
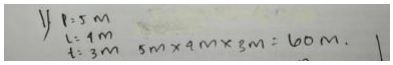
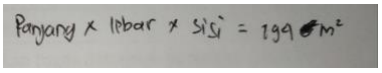
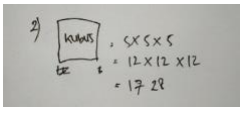
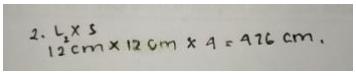
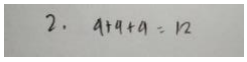
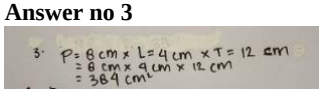
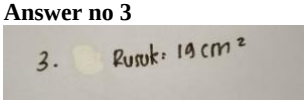
Table 4. Table of subject mathematics problem solving ability category

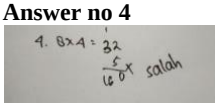
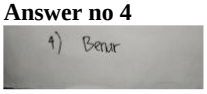
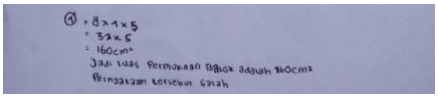
Category	n (%)	Subject code
High	n = 3 (15.8%)	S05, S06, S10
Moderate	n = 1 (5.3%)	S09
Low	n = 15 (78.9%)	S01, S02, S03, S04, S07, S08, S11, S12, S13, S14, S15, S16, S17, S18, S19

Based on the table, most of the subjects had low mathematical problem-solving skills (78.9% of subjects), some subjects had high mathematical problem-solving skills (15.8%), and only one subject (5.3%) had sufficient mathematical problem-solving skills.

The subject that is the focus of research is a subject that cannot solve mathematical problems. Furthermore, students' inability to solve mathematical problems based on indicators of mathematical problem-solving abilities are presented in the Table 5.

Table 5. Mathematical problem solving ability

Dimension	Subject answer	
Inability to understand and explore problems	**S18** **Answer number 1**  S18 cannot write the formula for the surface area of the block that has been presented in the problem.	**S13** **Answer number 1**  S13 wrote the elements of the length and width of the block in reverse, and made an error in writing the formula for the surface area of the cuboid that was presented.
	S07 **Answer number 1**  S07 made a mistake in writing the formula for the surface area of a block that has been presented in the problem.	**S04** **Answer number 1**  S04 misspelled the element in the block formula.
Inability to find strategy	**S19** **Answer no 2**  S19 uses an inappropriate strategy. S19 writes the formula for the volume of a cube, not the formula for the surface area of a cube.	**S13** **Answer no 2**  S13 made a mistake in writing the formula for the surface area of a cube. the formula written is not correct.
	S16 **Answer no 2**  S16 cannot find a strategy to solve the problem, in this case finding the formula for the surface area of a cube.	
Inability to use strategies to solve problems	**S14** **Answer no 3**  S14 uses an inappropriate strategy to solve the problems. In this case, S14 uses the formula for the volume of the cube to find the length of the perimeter of the cube.	**S11** **Answer no 3**  S11 cannot use any strategy to solve the problem.

Dimension	Subject answer	
Inability to look back and reflect on the solutions obtained	**S12** **Answer no 4**  S12 checks the block surface area asynchronously.	**S19** **Answer no 4**  S19 does not actually check the surface area presented and only guesses the answer.
	S09 **Answer no 4**  S09 checks the surface area of the beam, but does not write down the inspection strategy.	

Based on the classification of the subject's inability in each indicator, 16 subjects (84.2%) were stated to have different mathematical problem-solving disabilities in each dimension. The 16 subjects were then asked to fill in the academic procrastination scale, which the researchers categorized into three categories of academic procrastination. In detail, the distribution of the procrastination level is 16 subjects, which is obtained from the scores of the results of filling out the academic procrastination scale, which can be presented as follows in Table 6.

Table 6. Table of categories of academic procrastination in problem-solving mathematic

Category	n (%)	Subject code
High	n = 1 (6.3%)	S18
Moderate	n = 13 (81.2%)	S01, S02, S03, S04, S07, S08, S09, S11, S12, S13, S15, S16, S19
Low	n = 2 (12.5%)	S14, S17

Based on the results of problem solving skills (test), the researchers conducted interviews with subjects who experienced problem-solving disabilities based on each indicator to determine students' academic procrastination in solving mathematical problems. Based on the results of interviews, it was found that there were six factors behind students procrastinating in solving mathematical problems. The six factors are fear of failure, time organization, help-seeking, difficulty in making decisions, low concentration, and task avoidance.

From the results of interviews conducted based on the inability of students to solve math problems with reference to problem-solving indicators, subject 18 had a feeling of fear of being wrong or failing. Feeling afraid of being wrong is a form of student anxiety related to the evaluation (Akinsola, et al., 2007; Solomon & Rothblum, 1984). It is different with subject 18. Subjects 13 and 14 find it difficult to organize their time. An organizing time is something that everyone needs to have so that the planned activities run according to the plans made (Akinsola, et al., 2007). Subjects 07 and subject 12 seek help from others to solve math problems. A help-seeking is done to fulfill a task by asking questions or seeing other people's tasks (Solomon & Rothblum, 1984). Unlike the previous subject, subject 04 had difficulty in making decisions. The difficulty in determining something is an inability that students have to determine what

elements should be present and not present in completing the task (Solomon & Rothblum, 1984). Subject 13 cannot solve math problems because they have low concentration. Low concentration is a student's failure to focus his mind on achieving goals (Akinsola, et al., 2007). Subjects 11 and Subjects19 did avoidance to solve math problems. Task avoidance is the behavior of students who perceive assignments as a burden so that students tend to think that it will be better if they don't do it (Tuckman, 1991).

Students' Academic Procrastination Behavior in Mathematical Digital Literacy

Based on the research, by spreading the mathematical digital literacy scale, got the results of the categorization are as follows Table 7.

Table 7. Mathematics digital literacy ability categories

Category	n (%)	Subject code
High	n = 3 (15.8%)	S02, S08, S16
Moderate	n = 12 (63.2%)	S01, S04, S05, S06, S07, S09, S11, S12, S13, S14, S17, S18
Low	n = 4 (21.0%)	S03, S10, S15, S19

Based on the table, most of the subjects had moderate mathematical digital literacy skills (63.2% of subjects), some subjects had high mathematical digital literacy skills (15.8%), and several other subjects (21.0%) had low mathematic digital literacy skills. In this study, the subjects that became the focus of research were unable to perform digital mathematical literacy. Furthermore, the student's inability to perform mathematical digital literacy based on the dimensions of mathematical digital literacy is presented in the following Table 8.

Table 8. Table of students' disabilities in digital literacy

Dimension	Subject	Description
Attitude statement	S03, S10, S15, S19	Subjects expressed a low response to learning mathematics using technology, information, and communication
Engineering dimension	S03, S10, S15, S19	Subjects experience an inability to operate technology, information, and communication used in learning mathematics
Cognitive dimension	S10, S15, S19	Subjects experience an inability to understand things related to technology, information and communication.
Emotional social dimension	S15	Subjects experience an inability to build emotional social relationships with others using technology, information, and communication

Based on the details of the students' inability to carry out digital mathematical literacy with reference to the digital mathematical literacy indicators, four subjects had a low attitude towards learning mathematics by utilizing digital mathematical literacy, four subjects experienced disabilities in the technical dimensions, namely operating technology, information, and communication used in learning mathematics, three subjects experienced disabilities in the cognitive dimension, namely the inability to understand matters related to technology,

information and communication, and one subject experienced disabilities in the social-emotional dimension, namely the inability to build emotional, social relationships with others using technology, information, and communication (Hamutoglu, Gemikonakli, De Raffaele & Gezgin, 2020).

In this study, the subject that is the focus of research is a subject who cannot perform digital mathematical literacy or, in other words, subjects with low categories in mathematical digital literacy. Based on the results obtained, subjects with disabilities in digital mathematical literacy were measured for their academic procrastination behavior using the academic procrastination scale. The subjects who were declared unable to carry out mathematical digital literacy or, in other words, subjects with low categories in mathematical digital literacy amounted to 4 subjects (21%). The four subjects are S03, S10, S15, and S19.

Based on the results of research conducted when filling out the digital literacy scale, researchers conducted interviews with subjects who experienced disabilities in mathematical digital literacy based on each indicator to determine the factors behind students' academic procrastination behavior in mathematical digital literacy. Based on the results of interviews, it was found that there were seven factors behind students procrastinating in mathematical digital literacy. The seven factors are dislike of tasks, low concentration, help-seeking, avoidance of tasks, difficulty making decisions, self-doubt, and lack of assertion.

A dislike is a form of expression of rejection. The highest level of dislike in learning mathematics is delaying the completion of the mathematics assigmentas they have. Based on the academic procrastination scale results, S03 and S10 stated that they did not like learning mathematics that used technology, information, and communication. Dislike of assignments causes students to be reluctant to do assignments. Reluctance to complete an assignment will remain as long as the assignments is deemed unpleasant (Asri, Setyosari, Hitipeuw & Chusniyah, 2017).

The low ability to concentrate is the difficulty of students in focusing their minds on one thing. The form of concentration resistance can survive in noise, messy conditions, and other things considered to break concentration (Spillane, 2000). From the research results, S19 stated that he did not feel the better quality when involving technology, information, and communication in learning. This is due to the difficulty of the subject to concentrate when using information and communication technology. Subjects find it difficult to concentrate when social media notifications appear through digital devices used in mathematical digital literacy activities.

Using information and communication technology for learning, independence is needed. Both independence in finding information, as well as selecting information. Students who do

not have independence can be caused by dependence and help from others. In learning mathematics, the dependence and assistance in question can be in the form of material explanation assistance from teachers or friends. Based on the academic procrastination scale results, S03, S10, S15, and S19 stated that they could not learn mathematics independently by utilizing Information and Communication Technology. the dependency and help-seeking are defined as the behavior of relying on others to solve their problems (Tohara, 2021).

S3, S15, and S19 do not like mathematics learning that uses information and communication technology. This is due to the dislike of learning mathematics that uses technology, information, and communication. According to Tuckman (1991), a dislike of learning mathematics triggers avoidance. In this case, what is meant by avoidance is the avoidance of learning mathematics that uses technology, information, and communication. From the interviews conducted, S03 did not follow the development of new technology. This is due to S03's dislike of things related to technology.

Based on research, S19 cannot search and find out the truth of mathematical material obtained from the internet. This is due to S19's difficulty in making decisions. In this case, what is meant by decision-making is determining whether the information can be trusted or not. a difficulty making decisions is defined as the difficulty of students to determine what should be done (Yuan, Liu & Kuang, 2021).

S10, S15, and S19 do not understand issues related to web-based activities. In the interview, S10, S15, and S19 felt unsure about understanding the problems related to web-based activities. According to Akinsola, et al. (2007), lack of confidence in one's abilities is a negative thing that needs to be eliminated. Students should have confidence in their abilities so that they can manifest their abilities to the fullest. S15 states that he cannot communicate and discuss with others using technology, information, and communication. This is due to the students' lack of courage to state something. a lack of courage to state something (lack of assertion) makes students overshadowed by a sense of ignorance.

Factors Behind Students' Academic Procrastination Behavior in Problem Solving and Digital Mathematical Literacy

There are 18 factors of academic procrastination that are used as research material to determine the factors behind students doing academic procrastination in problem-solving and digital mathematical literacy. These eighteen factors are the combined results of several researchers. The eighteen factors are gender, fear of failure, task avoidance, self-doubt, time organization, low concentration, evaluation anxiety, perfectionism, difficulty in making decisions, dependence and seeking help, dislike of tasks, laziness, lack of assertion, fear of success, rebellion against control, taking risks, peer influence, and blaming others.

The research results found that the factors behind academic procrastination in problem-solving and digital mathematical literacy consisted of seventeen factors. The seventeen factors are gender, fear of failure, task avoidance, self-doubt, time organization, low concentration, evaluation anxiety, difficulty in making decisions, dependence and seeking help, dislike of tasks, laziness, lack of assertion, fear of success, rebellion against rules, taking risks, peer influence, and blaming others. One of the factors not found in this research is perfectionism.

Balkis and Erdinc (2017) states that the factors that influence academic procrastination are gender differences. Balkis stated that male students tend to have higher academic procrastination than female students. The results of the research conducted found that gender moderated procrastination behavior. However, from the study results, more procrastination behavior was carried out by women than men. This can be seen from the following data presentation:

Table 9. Table category capabilities digital literacy mathematics subject

Gender	Number of subjects	Number of academic procrastinators (%)
Male	7	n = 5 (71.4%)
Female	12	n = 11 (91.7%)

Based on the data above, 5 out of 7 males who were the research subjects (71.4%) did academic procrastination, while 11 out of 12 females who were the research subjects (91.7%) did academic procrastination.

Time management is something that every student must have in doing math assignments. With high time organization, students can easily set the priority scale so that assignments can be completed in accordance with the expected time. However, most students have low time organization, so students' activity plans do not work as they should. This is reflected in the filling of the academic procrastination scale carried out.

In learning activities, students should have high concentration skills so that learning materials can be absorbed properly. However, in the learning process, of course, many things can break students' concentration, such as a messy room, noise, etc.

Students often experience fear of failure. In learning mathematics, the fear of failure in question is students' fear if they fail or make mistakes in doing math assignments. In learning mathematics, problem-solving mathematical requires confidence in the abilities possessed. However, sometimes students feel unsure of their abilities on several occasions, so they tend to delay doing math assignments.

The anxiety related to the evaluation in question is anxiety about getting bad math scores and worries about teacher dissatisfaction with the results of math assignments carried out by utilizing information and communication technology.

Perfectionism is the behavior of students who judge themselves to the extreme. Students with a perfectionist nature always demand themselves to be the best. As with Solomon and Rothblum (1984), the results of this study indicate that perfectionism is not a factor that affects academic procrastination in problem-solving and digital mathematical literacy. Based on interviews conducted on 16 students who were declared academic procrastination in the previous stage, the results showed that none of them stated that the subject had a perfectionist nature.

One of the factors of academic procrastination, according to Solomon and Rothblum, is difficulty in making decisions, which in mathematics takes the form of difficulty in determining which elements must be present and not present in the problem-solving.

Solomon and Rothblum (1984) revealed that help-seeking is an academic procrastination factor in working on math problems in asking for answers from others. In this study, the form of dependence and help-seeking was obtained, namely asking for answers from other people through social media by utilizing digital devices when unable to do assignments and sometimes waiting for someone else to do it first to ask that person.

Solomon and Rothblum (1984) revealed that another factor that causes procrastination behavior is an aversion to the task. Students who don't like a task tend to delay because they think that the task they don't like only burdens the mind. The dislike of the task is reflected in the subject's academic procrastination scale filling. Laziness is a factor of academic procrastination, which is working on math problems takes the form of delaying in starting or completing math assignments. Students still delay doing math assignments, even though they know that laziness is a bad habit that must be avoided.

Lack of assertion is a factor of academic procrastination in the form of fear of asking other people. This factor is indicated by some students who are afraid to ask the teacher when there is something they don't understand related to learning mathematics.

Solomon and Rothblum, (1984) revealed that the factor that causes the emergence of procrastination behavior is the fear of success. Students who experience this tend to worry about not meeting other people's expectations of themselves in the next opportunity and worry about being hated by others. The rebellion against control is a factor of academic procrastination in the form of dislike or feeling burdened when people tell people to do something. The thing to do has a deadline.

One of the factors behind academic procrastination is risk-taking. In learning mathematics, risk-taking is meant to do assignments at the last minute of collection and even late in submitting assignments.

One of the factors behind the behavior of academic procrastination is peer influence. When students make friends with procrastinators, more or less will get a negative influence related to procrastination. Task avoidance is a form of student behavior that considers assignments a burden, so students prefer not to do assignments. In this case, it is the task of learning mathematics. This is reflected in the filling of the academic procrastination scale carried out.

Another factor that affects academic procrastination is the tendency to blame others. Students with this trait make other people shield themselves in doing procrastination in math tasks in learning mathematics. Students who blame others think that other people make it difficult for them not to procrastinate.

Based on the research conducted, there are six categories of student profiles in mathematical problem solving and mathematical digital literacy. The presentations for the six categories are presented through the following Table 10.

Table 10. Student profile in mathematical problem solving and mathematical digital literacy

Profile	Total (n)
High mathematical problem solving skills and high mathematical digital literacy skills	n = 0
Low mathematical problem solving skills and high mathematical digital literacy skills	n = 3
High mathematical roblem solving skills and moderate mathematical digital literacy skills	n = 2
Low mathematical problem solving skills and moderate mathematical digital literacy skills	n = 10
High mathematical problem solving skills and low mathematical digital literacy skills	n = 1
Low mathematical problem solving skills and low mathematical digital literacy skills	n = 3

Based on the table, the student profile in problem solving and mathematical digital literacy can be described as follows:

1. Subjects with high mathematical problem solving skills and high mathematical digital literacy skills

   From the results of the study, there were no subjects with high problem-solving ability categories and high mathematical digital literacy skills. Subjects with this category are ideal subjects that describe students' mathematical problem solving abilities and digital literacy skills in learning activities.

2. Subjects with low mathematical problem solving skills and high mathematical digital literacy skills

   From the results of the study, there were three subjects with low mathematical problem-solving abilities and high mathematical digital literacy skills. The three subjects are S02, S08, and S16. Based on the academic procrastination scale, the three subjects namely S02, S08, and S16 are included in the category of moderate academic procrastination.

3. Subjects with high mathematical problem solving skills and moderate mathematical digital literacy skills

From the results of the study, there were two subjects with high mathematical problem-solving ability categories and moderate mathematical digital literacy skills. The two subjects are S05 and S06. Based on the academic procrastination scale, the three subjects, namely S05 and S06, were included in the category of moderate academic procrastination.

4. Subjects with low mathematical problem solving skills and moderate mathematical digital literacy skills

   From the results of the study, there were ten subjects with the category of low mathematical problem solving ability and moderate mathematical digital literacy ability. The nine subjects are S01, S04, S07, S09, S11, S12, S13, S14, S17, and S18. Based on the academic procrastination scale, seven subjects namely S01, S04, S07, S09, S11, S12, and S13 were included in the moderate academic procrastination category, two subjects namely S14 and S17 were included in the low academic procrastination category, while one subject, namely S18 was included into the category of high academic procrastination.

5. Subjects with high mathematical problem solving skills and low mathematical digital literacy skills

   From the results of the study, there was one subject with high mathematical problem-solving ability categories and low mathematical digital literacy skills. The subject is S10. Based on the scale of academic procrastination, S10 is included in the category of moderate academic procrastination.

6. Subjects with low mathematical problem solving skills and low mathematical digital literacy skills

   From the results of the study, there were three subjects with the category of low mathematical problem solving abilities and low mathematical digital literacy skills. The three subjects are S03, S15, and S19. Based on the academic procrastination scale, the three subjects namely S03, S15, and S19 are included in the category of moderate academic procrastination.

Conclusion

Based on the results of research on the profile of students' academic procrastination behavior in problem-solving and mathematical digital literacy, it can be concluded that most academic procrastination occurs in problem solving mathematic, some students experience academic procrastination in mathematic digital literacy, and There are 17 factors behind students' academic procrastination behavior in problem-solving and mathematic digital literacy. There are six student profiles in problem solving and mathematical digital literacy. The six profiles are high mathematical problem-solving skills and high mathematical digital literacy

skills, low mathematical problem-solving skills and high mathematical digital literacy skills, high mathematical roblem solving skills and moderate mathematical digital literacy skills, low mathematical problem-solving skills, and moderate mathematical digital literacy skills, high mathematical problem-solving skills and low mathematical digital literacy skills and low mathematical problem-solving skills and low mathematical digital literacy skills.

References

Akinsola, M. K., Tella, A., & Tella, A. (2007). Correlates of academic procrastination and mathematics achievement of university undergraduate students. *Eurasia Journal of Mathematics, Science and Technology Education*, *3*(4), 363-370. doi:10.12973/ejmste/75415

Asri, D. N., Setyosari, P., Hitipeuw, I., & Chusniyah, T. (2017). The academic procrastination in junior high school students' mathematics learning: A qualitative study. *International Education Studies*, *10*(9), 70-77. doi:10.5539/ies.v10n9p70

Asri, D. N., Setyosari, P., Hitipeuw, I., & Chusniyah, T. (2017). The influence of project-based learning strategy and self-regulated learning on academic procrastination of junior high school students' students' mathematics learning. *American Journal of Educational Research, 5*(1), 88-96. doi:10.12691/education-5-1-14

Balkis, M., & Erdinç, D. (2017). Gender differences in the relationship between academic procrastination, satifaction with academic life and academic performance. *Electronic Journal of Research in Educational Psychology*, *15*(1), 105-125. doi:10.14204/ejrep.41.16042

Çapan, B. E. (2010). Relationship among perfectionism, academic procrastination and life satisfaction of university students. *Procedia-Social and Behavioral Sciences*, *5*, 1665-1671. doi:10.1016/j.sbspro.2010.07.342

Chen, C., Hewitt, P. L., Flynn, C. A., Ko, A., & Flett, G. L. (2020). Trait perfectionism and performance satisfaction in challenging laboratory problem-solving tasks. *Personality and Individual Differences*, *164*, 110110. doi:10.1016/j.paid.2020.110110

Claro, M., Cabello, T., San Martín, E., & Nussbaum, M. (2015). Comparing marginal effects of chilean students' economic, social and cultural status on digital versus reading and mathematics performance. *Computers & Education*, *82*, 1-10. doi:10.1016/j.compedu.2014.10.018

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Daulay, K. R., & Ruhaimah, I. (2019). Polya theory to improve problem-solving skills. *In Journal of Physics: Conference Series 1188*(1), 012070. IOP Publishing. doi:10.1088/1742-6596/1188/1/012070

Freeman, E. K., Cox-Fuenzalida, L. E., & Stoltenberg, I. (2011). Extraversion and arousal procrastination: Waiting for the kicks. *Current Psychology*, *30*(4), 375-382. doi:10.1007/s12144-011-9123-

Hague, C., & Payton, S. (2010). *Digital literacy across the curriculum*. Bristol: Futurelab.

Hamutoglu, N. B., Gemikonakli, O., De Raffaele, C., & Gezgin, D. M. (2020). Comparative cross-cultural study in digital literacy. *Eurasian Journal of Educational Research*, *20*(88), 121-147. doi:10.14689/ejer.2020.88.6

Hu, X., Gong, Y., Lai, C., & Leung, F. K. (2018). The relationship between ICT and student literacy in mathematics, reading, and science across 44 countries: A multilevel analysis. *Computers & Education*, *125*, 1-13. doi:10.1016/j.compedu.2018.05.021

Jablonka, E. (2003). Mathematical literacy. In *Second international handbook of mathematics education*, 75-102. Springer, Dordrecht.

Judge, S. (2005). The impact of computer technology on academic achievement of young African American children. *Journal of Research in Childhood Education*, *20*(2), 91-101. doi:10.1080/02568540509594554

Kawulich, B. (2004). Data analysis techniques in qualitative research. *Journal of research in education*, *14*(1), 96-113.

Kilpatrick, J. (2001). Understanding mathematical literacy: The contribution of research. *Educational studies in mathematics*, *47*(1), 101-116. doi:10.1023/A:1017973827514

Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences*, *82*, 26-33. doi:10.1016/j.paid.2015.02.038

Kim, Y., & Kim, Y. (2016). The influence of academic self-efficacy, and critical thinking disposition on problem solving ability of nursing students. *Journal of the Korea Academia-Industrial cooperation Society*, *17*(9), 589-598. doi:10.5762/kais.2016.17.9.589

Kissane, B. (2009). What does the internet offer for mathematics students?. In *22nd Biennial Conference of The Australian Association of Mathematics Teachers Inc.* (pp. 135).

Kosycheva, M. A., E. Tuzhba, T., V. Gaydamashko, I., & S. Yesaulova, K. (2020). Influence of low digital competence on procrastination of university teachers. *In 2020 The 4th International Conference on Education and Multimedia Technology*, 73-77. doi:10.1145/3416797.3416832

Milgram, N. N., Mey-Tal, G., & Levison, Y. (1998). Procrastination, generalized or specific, in college students and their parents. *Personality and Individual Differences*, *25*(2), 297-316. doi:10.1016/s0191-8869(98)00044-0

Montague, M., & Applegate, B. (2000). Middle school students' perceptions, persistence, and performance in mathematical problem solving. *Learning Disability Quarterly*, *23*(3), 215-227. doi:10.2307%2F1511165

Ng, W. (2012). Can we teach digital natives digital literacy?. *Computers & education*, *59*(3), 1065-1078. doi:10.1016/j.compedu.2012.04.016

Nordby, K., Løkken, R. A., & Pfuhl, G. (2019). Playing a video game is more than mere procrastination. *BMC psychology*, *7*(1), 1-12. doi:10.1186/s40359-019-0309-9

Paley, J. (2016). *Phenomenology as qualitative research: A critical analysis of meaning attribution*. Taylor & Francis.

Pinxten, M., De Laet, T., Van Soom, C., Peeters, C., & Langie, G. (2019). Purposeful delay and academic achievement. A critical review of the Active Procrastination Scale. *Learning and Individual Differences*, *73*, 42-51. doi:10.1016/j.lindif.2019.04.010

Sarkar, S., Mohapatra, S., & Sundarakrishnan, J. (2017). Assessing impact of technology based digital equalizer programme on improving student learning outcomes. *Education and Information Technologies*, *22*(1), 195-213. doi:10.1007/s10639-015-9434-0

Schoenfeld, A. H. (1987). Pólya, problem solving, and education. *Mathematics magazine*, *60*(5), 283-291. doi:10.1080/0025570X.1987.11977325

Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology*, *31*(4),503-509. doi:10.1037/0022-0167.31.4.503

Spillane, J. P. (2000). Cognition and policy implementation: District policymakers and the reform of mathematics education. *Cognition and instruction*, *18*(2), 141-179. doi:10.1207/s1532690xci1802_01

Tohara, A. J. T. (2021). Exploring digital literacy strategies for students with special educational needs in the digital age. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(9), 3345-3358. doi:10.17762/turcomat.v12i9.5741

Tohir, M. (2018). Students' creative thinking skills in solving mathematics olympiad problems based on problem-solving Polya and Krulik-Rudnick model. *Advanced Science Letters*, *24*(11), 8361-8364. doi:10.1166/asl.2018.12563

Tuckman, B. W. (1991). The development and concurrent validity of the procrastination scale. *Educational and psychological measurement*, *51*(2), 473-480. doi:10.1177/0013164491512022

Yilmaz, M. B. (2017). The relation between academic procrastination of university students and their assignment and exam performances: The situation in distance and face-to-face learning environments. *Journal of Education and Training Studies*, *5*(9), 146-157. doi:10.11114/jets.v5i9.2545

Yockey, R. D. (2016). Validation of the short form of the academic procrastination scale. *Psychological reports*, *118*(1), 171-179. doi:10.1177/0033294115626825

Yuan, Y. H., Liu, C. H., & Kuang, S. S. (2021). Innovative interactive teaching model for cultivating digital literacy talent in decision making, sustainability, and computational thinking. *Sustainability*, *13*(9), 5117. doi.:10.3390/su13095117

Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: a meta-analytic investigation. *Frontiers in psychology*, *10*, 1613. doi:10.3389/fpsyg.2019.01613

Zulkarnain, Z., Heleni, S., & Thahir, M. (2020). Digital literacy skills of math students through e-learning in COVID-19 era: a case study in Universitas Riau. *In Journal of Physics: Conference Serie,s 1663*(1), 012015. IOP Publishing.