



Conceptual Design of Digital Anxiety Detection-Tools for Students School Anxiety

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Abstract. This study aimed to develop a conceptual design of DAD (Digital Anxiety Detection-tools) for students. DAD is an alternative tool to identify student anxiety more specifically and in real-time based on physical symptoms and the identification of students' psychological conditions. This research model uses the modified ADDIE design with the Analyze, Design and Development stages. The results of this study identified physiological symptoms of anxiety experienced by students in the form of increased heart rate, shortness of breath, cold sweat, and several other symptoms. The product prototype theoretically focuses on measuring the physiological symptoms of student anxiety. The product prototype is a flowchart design, a tool to measure the condition of students' anxiety symptoms in real-time, and can compare them to the baseline of students' situations. The digital application system is based on Convolutional Neural Network (CNN), integrated with a digital sphygmomanometer and Passive infrared. The results of this research are still in the form of product design, so it requires further development steps in the development, implementation, and evaluation process.

Keywords: anxiety Detection · School Anxiety · Physiological Symptoms

1 Introduction

Anxiety is a condition experienced by almost every individual, including students in madrasah. In general, students with school anxiety avoid school due to emotional stress, fear, and facing the school, not in the form of juvenile delinquency [1]. If this condition continues in the long term, it will hinder students' academic achievement, social development, and developmental tasks [2]. Studying and learning are necessary to prepare conditions in which activities and interactions can help develop themselves.

This fear causes students to avoid attending school. However, this will be a different response for each student. There are four levels of students who experience school anxiety, (1) Initial school anxiety behavior (lasts for a short time and is spontaneous, can end by itself without intervention), Substantial school anxiety behavior (within two weeks, some need to get intervention), Acute school anxiety behavior (for two weeks to a year, requires intense intervention); Chronic school anxiety behavior, (lasts more than

one year, requires very intense and continuous intervention) [1]. The longer a child is out of school, the more effort is needed to get him back to school.

Alleviation of students from school anxiety conditions needs to be alleviated by various parties, especially School Counselors. School counselors can provide counseling using a systematic desensitization (SD), technique that provides services to overcome anxiety [3]. SD is a technique that changes anxiety through images (images) and direct experience [4]. This technique has advantages in describing the anxiety level and providing student experiences in dealing with anxiety situations. However, the DS and other conventional counseling techniques have limitations in providing supporting resources and estimating power to the low accuracy of measuring student questions.

The alleviation of anxiety through counseling has been studied in various studies. Various types of stress and fear were identified as the result of an excessive stressor causing impaired response [5]. At a different level, the disorder has predictive and automatic symptoms as a mental disorder [6]. The cognitive-behavioral counseling paradigm has become a paradigm that has had high success in providing interventions to reduce anxiety. Several techniques in the cognitive behavioral paradigm that are often used to reduce anxiety include relaxation [7], imagery [8], and systematic desensitization [4].

The measurement of anxiety in several contexts of previous studies has been successfully studied and developed through the integration of several required sensors [9, 10]. The overall research foundation tends to view conventional counseling strategies as generally emphasizing self-reporting of anxiety measurements with the capacity of counselors and counselees full of limitations and various perspectives of meaning [11]. The complexity of an anxiety condition experienced by a person requires detailed and comprehensive measurements so that the intervention given has the right level of targets and targets.

The complexity of a person's anxiety condition is in line with the state of the anxiety factor, namely the stressor. Anxiety is present on the stimulus from the stressor, which causes misinterpretation in cognitive processes, produces feelings that tend to be negative, and ends with behavioral and physiological responses in the form of avoidance [12]. These factors tend not to be accurately measured through the self-report and observation methods commonly used in counseling and psychotherapy interventions.

The researcher aims to develop a digital-based anxiety measurement tool model to increase the effectiveness of counseling services in reducing student anxiety. Emotional digitization is expected to become a comprehensive and more accurate counseling assessment of student anxiety (cognitive, behavioral, and physiological). This product is expected to facilitate and maximize counseling services using the SD technique, especially to reduce student anxiety at school.

2 Methods

This study uses a research and development model that refers to the ADDIE development model. Based on the objectives of this study, the ADDIE development procedure was adapted in 3 stages. The three stages are (1) Analysis Stage, (2) the Design Stage and (3) Development Phase. The three stages of development follow the achievement of the development results in the form of a conceptual design or prototype for this research.

This study involved 240 students as research subjects in the analysis stage. Students are engaged in measuring anxiety through the anxiety scale in Madrasahs. The scale has a high level of reliability. It is 0.860 on the Cronbach alpha coefficient. The item analysis also shows the validity of the correlation coefficient of all items above 0.3 or significant at the 0.05 level.

The results of the measurement data are then analyzed descriptively and graphically. The results of the data analysis then become the basis for designing the product's conceptual design. In particular, product development focuses on interpreting student anxiety symptom data.

3 Results and Discussions

Data of this research are explain in two part, based on the research procedure. The first part is explain the school anxiety physiological symptoms on students. The next part is explain the design and development of the prototype.

3.1 Student School Anxiety Physiological Symptoms Identification

Based on Fig. 1, there are symptoms the students feel regarding their school anxiety. The most percentage symptom is "heart pounding". The graph shows that 54.94% of the students felt a "heart pounding" when the anxiety arose. The second symptom most felt by the students is "Shaking" at 35.19%. The other three symptoms, which are felt by more than 20% of students, are "hard to sleep" at 22.84%, "feel tired" at 25.93%, and "cold sweating" at 22.84%. Based on the data, four of five symptoms (except the hard-to-sleep) could be measured on the spot when the anxiety situation arises.

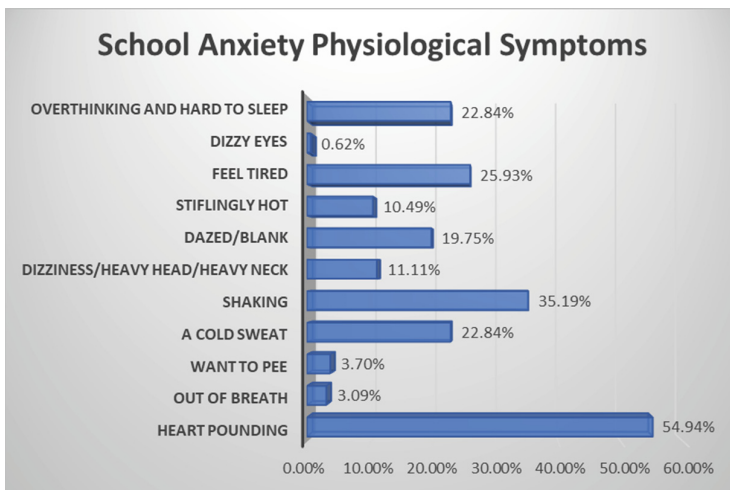


Fig. 1. Physiological symptoms of students' school anxiety.

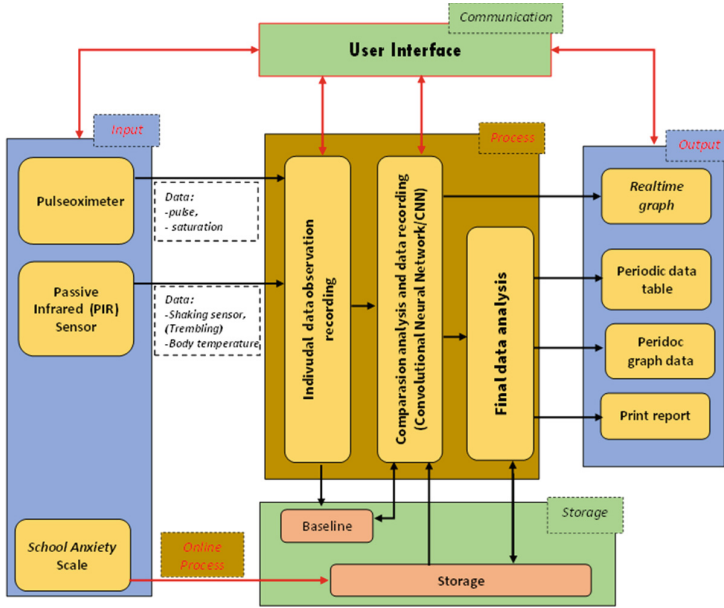


Fig. 2. System Flowchart of Digital Anxiety Detectors.

3.2 Prototype of the Product: System Flowchart

The flowchart are shown the system process on the tools to detect, measure and report the anxiety symptoms on students.

The first part is the input data using the pulse oxymeter, and passive infrared sensor. The pulse oxymeter will measure the pulse and the saturation of students. Passive infrared sensor will measure the shaking and body temperature of the students. The data collected by those two devices are sent to the main system. The system will record the baseline data. The baseline data is the measurement on the first five minutes of the counseling process, which is the condition of the student is stable (without any anxiety comes).

The next process is using convolutional neural network. The machine learning will adapt the baseline and the realtime data when the student’s anxiety comes and make a symptoms. The analysis result will report as the realtime graph, periodic graph and table. Counselor as the user of the product will reported the graph realtime to identify the anxiety level of the students. Counselor also cant print the periodic table and graph.

The results of this study summarize the conditions of anxiety symptoms experienced by students physiologically. Students have experienced these symptoms, but objective identification is necessary to measure the physiological symptoms that arise accurately. Furthermore, the product design in the flowchart system flow becomes a product design that follows these needs. The flowchart in Fig. 2. Describes the measurement of physiological symptoms in the form of body temperature, heart rate, saturation, blood pressure, and body vibrations (tremors).

Anxiety in a person is a condition that appears in various aspects. The cognitive part of anxiety focuses on irrational perceptions and beliefs about the fear state [13]. Aspects of feelings arise from anxiety, fear, discomfort, and other disturbing emotions. Behavioral factors include avoidance, shouting, crying, staying still, and other defensive behaviors. In addition to these three aspects, physiological aspects appear in individuals with high anxiety. Physiological elements appear in the form of changes in heart rate, cold sweat, body temperature, shortness of breath and oxygen saturation, shaking (tremor), and others. These symptoms appear automatically in response to the anxiety experienced [14].

In this study, the product developed was projected to measure physiological symptoms. Symptoms and physiological responses of a person arise from subconscious conditions that have been influenced by individual beliefs [15]. In addition, the physiological aspects of people with anxiety symptoms tend not to be easily controlled. These symptoms appear on their own and often change uncontrollably. Someone can generally control physiological symptoms after the intensity of anxiety experienced by a person has decreased or has been handled [16].

Control of anxiety symptoms can be done psychologically, either through changing thoughts, managing emotions, and changing behavior. In particular, the management of physiological symptoms generally depends on how to transform and drive the 3 aspects of a person's cognitive, emotional, and behavioral anxiety [17]. The individual's success in changing his thoughts, emotions, and behavior will impact full control of consciousness and peace within him. At the same time, these conditions will reduce the symptoms of individual physiological reactions.

Accurate measurement becomes the basis for determining the hierarchy of student anxiety. Anxiety hierarchy functions in providing interventions according to the level of anxiety experienced by students [18]. Thus, the accuracy of measuring students' anxiety symptoms greatly affects the treatment given.

This product prototype is based on the integration of medical measuring instruments for the physiological symptoms experienced by students. Measurements using a digital blood pressure meter can provide accurate data related to blood pressure, pulse (heart rate), and breath saturation [19]. Passive Infra-Red sensor functions to measure body temperature and body vibrations [20]. The integration of the measuring instrument is then constructed in a Convolutional Neural Network (CNN) based system.

The CNN system in this product becomes a machine learning process, namely testing and training the system to provide the right output on the existing data. In measuring students' anxiety symptoms, CNN is a data processing and interpretation process for recorded physiological symptoms. Furthermore, CNN can refine the interpreted input values to become the best parameter values for each input data.

Furthermore, the interpretation of the CNN data processing results is presented in students' realism graphics. Realtime graphics of anxiety symptoms will help counselors to know the condition of students with symptoms experienced. Thus, the output data can describe the symptoms of anxiety experienced by students in real-time against the baseline condition (students are stable and do not experience symptoms of anxiety).

The design of this product has demonstrated accuracy and adaptability in theoretical and conceptual studies. This product prototype is an alternative that has high enough success. Furthermore, further development and practical testing will provide experimental evidence for the product's success in supporting counseling in reducing students' anxiety.

4 Conclusions

The results of this study identified physiological symptoms of anxiety experienced by students in the form of heart pounding, cold sweat, feeling tired, and several other symptoms. The results show that not all the physiological symptoms are felt by the students. The most common symptoms felt by students are the focus to be measured by the development product. The product prototype is a system flowchart design, a tool to measure the condition of students' anxiety symptoms in real-time, and can compare them to the baseline of students' situations. The digital application system is based on Convolutional Neural Network (CNN), integrated with a digital sphygmomanometer and Passive infrared. The results of this research are limited to the prototype phase of the product. The prototype need to be developed in the fully function system both in hardware and software. The field test also need to make the implementation phase of the development model procedure.

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