Research Article

Teaching of Make Prototype Step of Design Process by E-tutors in Open and Distance e-Learning Context*

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Abstract

The ODeL model is noted for its unique approach to courses especially that aimed at producing future entrepreneurs. The make prototype part of the design process is viewed as a foundation for entrepreneurship education in this article. An objective was set to see how e-tutors' topic expertise affects their capacity to help students envision the make prototype step of the design process in order to attain this goal. 350 postgraduate students enrolling in a semester module in 2020 were the subject of the research. In order to assist students with the make of the make prototype stage of the design process in an ODeL context, an online observation tool was utilized to study the expertise of e-tutors. The data acquired from five different e-tutor websites was evaluated. According to the findings, e-tutors in ODeL settings were unable to conceptualize the make prototype stage of the design process. Suggestions: An alternative technique for e-tutor appointments is proposed based on the current concept.

Keywords: Make prototype, design process, e-tutoring, open and distance e-learning

1. INTRODUCTION

Higher Education Institutions (HEIs) are under constant pressure to make their curricula more relevant, particularly those that focus on labour markets. An example of a recent demand for HE frameworks was the need to assess all curricular offerings and make curricular structure adjustments Eguia (2022). The design process approach Luka, which is delivered in HE institutional frameworks with an emphasis on the development of critical labour market skills, is one such curriculum (2020). Its emphasis shifted to innovation in other spheres of education, such as technology Pande and Bharathi (2020). The method was developed with a focus on human centeredness, keeping in mind that it is a new approach and practice in the innovation domains, including education Magistretti, Ardito and Pertuzzelli (2021). To summarize, a design problem begins with a problem and finds a legitimate solution, as stated by Gaborov and Ivetic (2022). A momentum built around the concept based on its human emphasis, and recently (Auernhammer & Roth, 2021; Dell'Era, Magistretti, Cautela, Verganti & Zurlo, 2020; Magistretti, et al. 2021; Roth, Globocnik, Rau & Neyer, 2020; Caputo, Pizzi, Pellegrini & Dabic, 2021) became part of the narrative. According to Dell'Era et al, (2020), the design process was growing. However, Roth et al. (2020) cautioned that little is known about whether the design approach leads to classroom innovation. Given the varied narratives, it is necessary to comprehend the various perspectives on the design process that exist in literature.

From literature, it is amass on how the design process is explained. In this paper, it was important to find an explanation that would address two issues of "solving problems and finding solutions". Two authors, (Caputo, Pizzi, Pellegrini, & Dabic, 2021; Dam & Siang, 2020) contributed to a better understanding of the term, is a continuous process in which a user's assumptions are tested and challenges are reimagined to provide new tactics and solutions Dam and Siang (2020). The design

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process is a recursive approach to understanding and solving problems that has a reputation for being particularly well adapted to handling complicated problems with no obvious solutions Pellegrini, (2021). The application of what is known about the design process to the realization of skills for the labour market is crucial in order to proceed to the attention that was previously garnered from the substantial amount of literature on what is known about the design process. The introduction of e-tutoring as a mechanism for student academic assistance and development in higher education is critical for skills to become relevant in labour markets. This line of reasoning supports (Ece & Kazazoğlu, 2021; Tuncay, 2021; Zalat, Hamed, & Bolbol, 2021)'s assertion that pupils would benefit from such an undertaking, particularly in light of the COVID-19 pandemic's negative impacts. True, because e-tutoring provides students with substantial fundamental benefits such as convenience, ease of participation, lower costs, and technology-driven benefits (Gherhes, Stoian & Farcasiu, 2021). The efficacy of e-tutoring is growing, and there is a demand for adequately qualified and well-prepared e-tutors for various modules in higher education. In this study, a well-prepared e-tutor must still be built because it is entrusted with assisting students with the design process, which is taught in procedural steps.

Due to the difficulties in teaching the design process steps, this paper focused on the make (prototype) stage of the design process. The make prototype stage is the fourth stage of developing the initial models, according to literature, where the initial specific procedures were offered to reach a preliminary design that is accurate according to solution visualization with thorough descriptions of the model Aldalalah (2022). At this stage, according to Yalzin (2022), groups choose and illustrate the best solution to the problem discovered during the idea creation phase, and prototypes are created by adhering to the children's drawings as closely as possible. In the make prototype phase, developers Vuillermin and Huck-Sandhu (2021) put their ideas to the test by bringing them to life, where they are tested to quickly obtain feedback and gain deeper insights into their thoughts and behaviours. The make prototype phase ought to provide valuable feedback about the product's function and practicality. In this paper, it is still unclear how much assistance the students receive from their e-tutors, especially since they are working in a virtual environment and are focused on the make prototype stage of the design process. All of this is to say that (Aldalalah, 2022; Vuillermin & Huck-Sandhu, 2021; Yalzin, 2022) provided a foundation from which to build an understanding of what is known about the make prototype stage within the design process.

2.1. Problem of the Study

'How do e-tutors' teach the make prototype step of the design process?. This goal was based on the following research question.

2.2. Research Question

How did the e-tutors' content knowledge effect the students' understanding of the design process's make prototype stage?

2.3. Research Objective

To evaluate e-tutors' skills to teach students about the make prototype stage in order to help them comprehend how it contributes to the design process.

2. METHOD

2.1. Research Design

This study used a quantitative way to address the main research question, allowing students to describe how they believe their e-tutor abilities to apply their topic knowledge to teach the make prototype stage of the design process. The quantitative data was employed as a scope and depth of comprehension and confirmation of the data gathered in the quantitative approach Bryman (2012).

2.2. Participants

This study included a total of 350 students that were enrolled in a module. The sample selection was based on the year's enrolment of the honours students. Convenient sampling was also used. The primary goal was to provide detailed accounts based on a quantitative analysis of how their e-tutors teach the design process. During the teaching of the make prototype stage of the design process, e-tutors clarified and attempted to defend viewpoints that gave information from students on their selection, usage, and general application of their methodologies.

2.3. Research Instruments

To satisfy the paper's objectives, data was collected utilizing an observation-based research instrument built by the paper's researcher. Five e-tutor postings and their students' responses were included in the instrument. The Learning Management System was used to track the number of postings per e-tutor (LMS). There were multiple posts in the system depending on the e-message tutors to the students. Those that related to content knowledge for the make prototype nature were chosen and recorded in frequency from the various postings. It was recorded the number of times a posting occurred. Finally, for each of the five e-tutors, the data was converted, improved, and converted into tables. In the event of a critique of the instrument, this is a practical instrument that best matched the role it was meant for. The raw data obtained in the LMS was printed and delivered as hard copies to senior colleagues in the department for verification reasons in order to validate the instrument

2.4. Data Analysis

From a data collection of observations, descriptive data were obtained. The analysis in this paper concentrated on the total number of postings from the five e-tutors. For instance, it could be assumed that three out of five e-tutors posted for the item generated for the paper from a specified table. An conclusion will be drawn based on what is visible from each table in such a description. In order to clarify certain parts of comprehending e-tutor skills to teach the make prototype stage of the design process in a virtual environment, three tables were employed. The ability of e-tutors to envision the make prototype stage of the design process was studied in Table 1. Table 2 e-tutor skills to aid students' present thoughts about the make prototype stage of the design method provided the second clarity in the paper. Table 3 established e- tutor skills to aid students during the make prototype phase, which was the final table for the paper.

3. FINDINGS

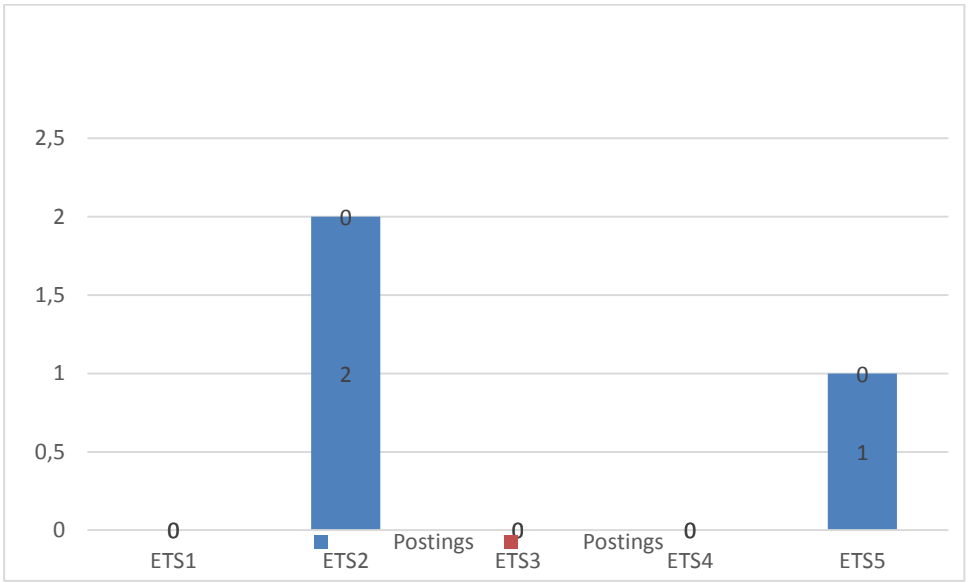

Figure 1. e-tutor abilities conceptualize the make prototype stage of the design process

Figure 1 shows the responses to an item created to assess e-tutors' ability to conceive the design process's make prototype step. According to the table, three out of five e-tutors (ETS1, ETS3, and ETS4) did not post for the item. Another observation revealed that the students had only two e-tutors (ETS2 and ETS5). There were no postings in relation to the students' responses to the two e-tutors, according to the statistics. These findings imply that e-tutors were unable to aid students in conceptualizing the design process's make prototype stage. At the same time, based on the students' findings, one obvious argument that can be made about them is that none of them engaged in all of the postings. The students' refusal to respond to the postings could indicate a lack of comprehension, which could affect their conceptualization of the make prototype step of the design process.

Figure 2 e-tutor abilities to assist students present ideas about the make prototype stage of the design process.

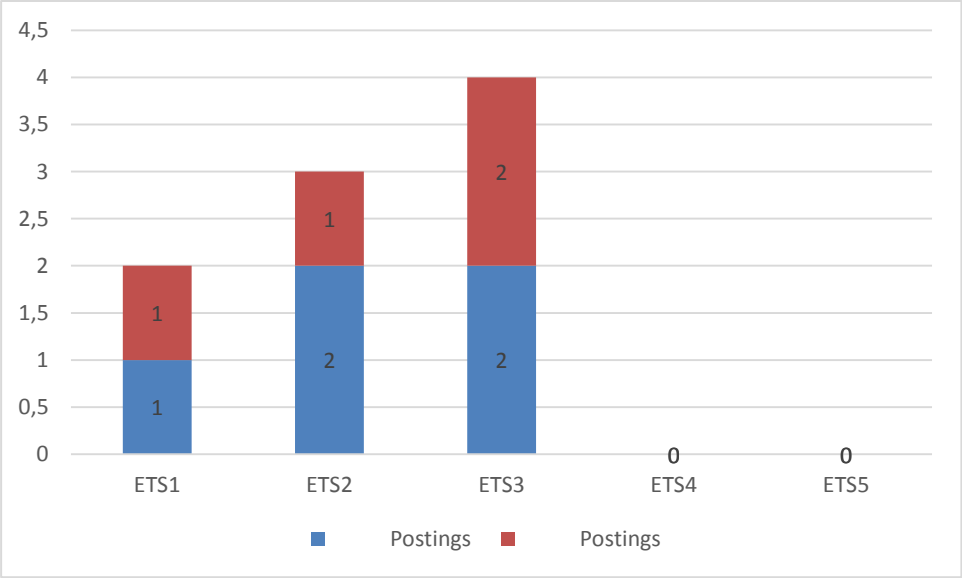

Figure 2. e-tutor abilities to assist students present ideas about the make prototype stage of the design process

Figure 2 shows the responses to a question designed to see if e-tutors can help students convey their ideas during the make prototype stage of the design process. According to the observations, three e-tutors (ETS1; ETS2; and ETS3) posted for the students in more than half of the cases (ETS1; ETS2; and ETS3). With two e-tutor postings each, ETS2 and ETS3 had the maximum number of e-tutor postings. It's also clear that ETS3 received the most answers from online students, with two postings. However, these findings were countered by the fact that ETS4 and ETS5 did not post for the students. Through this analysis, it is clear that more than half of the students were given assistance in presenting their finest ideas for the make prototype stage of their design process projects. The students benefited from their interactions with such e-tutors, which is at the heart of this comparison.

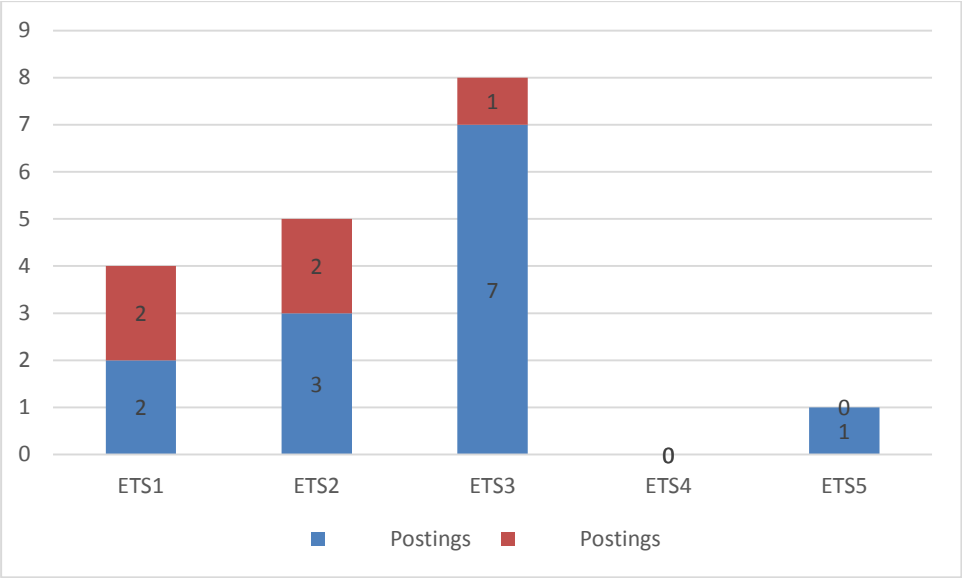

Figure 3. e-tutor abilities to guide students for the process of the make prototype phase

Figure 3 shows the responses to an item designed to determine whether e-tutors have gained the ability to lead students through the make prototype phase. Four e-tutors (ETS1; ETS2; ETS4; and ETS5) were observed out of five, which is more than half of the e-tutors advertised for the students. There's also a breakdown of how students responded to the e-tutors. ETS3 has the most e-tutor listings (seven), followed by ETS2, which had three. Similarly, in ETS1 and ETS2, an equal number (one posting) of online students' responses were observed. The fact that e-tutor sites had a higher number of postings indicates that students had successfully acquired a variety of abilities that might guide them through the make prototype phase of the design process. Another conclusion that can be drawn about students who are assisted by the e-tutors who were observed is that they have enough abilities that have a favourable impact on student engagement, as evidenced by the two postings that were evident from the students' responses.

4. DISCUSSION

The development of this work was guided by a specific single purpose. The use of three tables was broadened to achieve this purpose. In this work, the discussions at the three tables were reversed, beginning at Figure 3 and ending at Figure 1. This investigation is based on a construct to determine whether students' tutors had acquired the ability to instruct students in a virtual environment throughout the make prototype phase of Figure 3's procedure. The discussion that follows is predicated on a high regard for the paper's goal. It has been discovered that e-tutors outperform the average when it comes to learning how to assist students through the make prototype step of the design process in a virtual environment. The findings were in line with recent research by Guaman-Quintanilla, et al. (2022), who found that facilitators in a design thinking course considerably improved their guide abilities as they progressed to the make prototype stage, where they show a lot of inventiveness. These findings were consistent with those of Koroglu and Yildiz (2021), who found that students had a good time, that brainstorming for the make prototype stage went smoothly, that they were able to determine the ultimate goal from their abilities, that they were able to determine the needs and solutions for the make prototype stage of the design process, and that they had a good time during the guidance, which was most entertaining. The findings (Guaman-Quintanilla, et al. 2022; Koroglu & Yildiz, 2021) were supported by reports (Almaghaslah & Alsayari, 2022; Yedra & Aguilar, 2022), which found that students who were paired to assess the success of their make prototype activities showed significant improvements in their overall performance. Almaghaslah and Alsayari (2022) validated Yedra and Aguilar's findings that during the application of a software system for

students with dyslexia towards the development of content levels for make prototypes, the students were able to interact with the playful application part, which gave them the option of interacting with the make prototype's playful activities. (Almaghaslah & Alsayari, 2022; Guaman-Quintanilla, et al., 2022; Koroglu & Yildiz, 2021; Yedra & Aguilar, 2022) it is determined that students benefited from the strategies that made unique demands on how the make prototype stage is taught, especially in a virtual environment. Furthermore, the findings of Colombelli, et al. (2022) added to what was previously said, implying that students' perspectives regarding entrepreneurial education and the types of abilities gained from a make prototype program in which they participated were positively influenced. Importantly, these children were involved in Constructivism on a regular basis. Another conclusion is that the cohort of pupils coached by the sample e-tutors would be able to meet Constructivism's cognitive needs. Luka (2020) cited these events in literature as the development of crucial labour market skills for students who were assisted by e-tutors in the make prototype step of the design process.

Another piece of evidence from Figure 2 shows that there were positive outcomes based on a construct that was created to see if e-tutors can help students' express ideas during the make prototype stage of the design process. The design process on targe as a curriculum to be taught has made positive development, according to the construct report, in the field of the make prototype phase. This confirms what was previously known from the theoretical framework: students who received instruction using techniques that target the make prototype stage of the design process became active participants in virtual environment experiences as they were actively constructing knowledge. Being active participants could be interpreted as a commitment to human-centeredness. Magistretti (2021) uses buzzwords like practice and innovation to see if students gain from the ways they were helped to submit their best ideas regarding the make prototype stage of the design process. Students said they were imaginative after being given the core information and abilities for the prototype phase of the design process, Eguia (2022). Those in the Liu, et al. (2022) report agreed with an earlier report in Eguia (2022) that they were positively influenced in pre-professional roles where they learned to adapt from being a student to a professional person under the guidance of their teachers toward their abilities toward presenting about the make prototype stage of the design process. Robins and Fu (2021) also found that using innovation design thinking for prototyping methods improves students' innovative performance. This study looked at the evidence for teaching the make prototype part of the design process, and it was found to be conclusive that virtual students benefit from having e-tutors help them express ideas regarding the make prototype phase of the design process. According to Aldalalah (2022), the e-learning course functioned well in providing possibilities for all students who participated in the building of the prototype to freely comment on it due to its ability to provide immediate feedback. Children gained important skills during the make prototype phase, according to another report by Yalzin (2022), where it was stated that children were able to transfer what they learned during the make prototype phase to their real lives and use what they learned at schools to solve other problems at home. Another study by Chan and Nagatomo (2022) indicated that students who worked on a corrugated cupboard had higher confidence in overcoming obstacles during the make prototype phase of the design process than students in other classes. According to (Aldalalah, 2022; Chan & Nagatomo, 2022; Eguia, 2022; Magistretti, 2021; Robins & Fu, 2021; Yalzin, 2022); Martinez and Crusat's (2019), qualitative findings, students who worked on innovative solutions to real-world problems showed that the program they were a part of had a good impact on their propensity to become entrepreneurs.

The final paper presentation was based on Figure 1, which aimed to test if e-tutors could understand the design process' make prototype stage. The fact that e-tutors were unable to conceive the make prototype stage of the design process resulted in a less favourable assessment on the construct. The less favourable results were in contrast to what was previously thought to be the

foundation of this article, which stated that constructivism would best suit active students engaged in the production of knowledge for the make prototype stage of the design process. The point made here concerning the idea is not unique, but Roth et al. (2020) previously said that it is still unknown whether how the make prototype phase is taught in virtual classrooms has an impact on both innovation and as a vital labour market supplier. Additional research (Akgul, et. al. 2021; Chan & Nagatomo, 2022; Galoyan, et. al. 2022) bolstered the distinctions made by Roth (2020). According to Akgul, et. al. (2021), the participants were frustrated by time limits and certain challenges caused by a lack of clear time guidelines on when to complete the make prototype phase of the design process, particularly when they were working in a virtual environment. According to Chan and Nagatomo (2022), some students felt the assignment based on the make prototype phase to be difficult and that the content was too much for them. Students reported experiencing constraints from their make prototype project materials when their original solutions were revised to accommodate changes in the design approach, according to Galoyan, et al. (2022).

Additional study was undertaken on the make prototype stage of the design process (Ajit, et al. 2022; Murphy, et al. 2021; Sorby & Panther 2021). Due to a lack of sketching skills, Ajit, Lucas, and Kanyan (2022) observed that the pupils lacked the ability to produce and convey ideas on spatial visualization capacities. The report (Ajit, et al., 2022) with a claim where the students were to present on developing a robot that picks up litter for their prototypes, they noted that the iterative phases of the make prototype stage were difficult. Similar findings were found in another study of students' product creation during the make prototype phase, when it was discovered that they lacked comprehension and planning during a brief project and product development process Murphy, et al (2021). The same findings were reported by Sorby and Panther (2020) earlier this year, who claimed that pupils lacked spatial vision skills, which are a crucial cognitive aspect in student achievement of the make prototype stage.

5. CONCLUSION

What effect did the e-tutors' gained content knowledge have on the students' understanding of the make prototype stage of the design process, which was the basis for major paper discussions? These were motivated by a single goal: to evaluate e-tutors' ability to teach the make prototype stage to students in order to help them grasp its role in the design process. The build, whose goal was to investigate if e-tutors could comprehend the make prototype stage of the design process, yielded a negative result. Some unfavourable consequences were reported, along with an indication that e-tutors lacked the ability to conceive the make prototype stage of the design process, resulting in a less favourable evaluation. The findings are based on initial processes that were spelled out regarding what the design process curriculum should achieve from students who were taught the make prototype stage. The derailment stems from a misperception that the design process is intended to have two major effects: innovation and possibilities to become a key labour market provider. The incapacity of students to become innovative has major implications for future employment chances, as the labour market will face certain gaps due to a lack of cognitive capacities for the critical stage of making a prototype during the design process. This is the case since the make prototype phase is where ideas are put to the test by bringing them to life, according to Vuillermin and Huck-Sandhu (2021). Further, there is a case to be made that in order to attain fruition from putting ideas to the test and bringing them to life, it is critical to remember that it must be done from a human-centered perspective. Magistretti is a fictional character that appears in the year 2021. Dell'Era et al. (2020) said that the design process was growing because of its focus on the human element. However, the report from the construct for the paper was not that positive. According to the literature, Roth, et al. (2020) found that it is still unknown whether how the make prototype stage is taught has an impact on both innovation and as a key labour market provider. At the same time, Galoyan, et al. (2022) observed that the same

students who must participate in the labour market had constraints as a result of their make prototype project. Part of this reasoning was based on Chan and Nagatomo's (2022) observation that some students considered their assignment based on the make prototype phase to be difficult.

The students in the case study were similar to those who reacted to this construct by inferring that they received less support in developing abilities to envision the design process's produce prototype stage. The findings were supported by Akgul, et. al. (2021), who noted that the participants were frustrated since they were given no clear time restrictions on when to complete the make prototype phase of the design process, especially when they were working in a virtual setting. To summarize, the students who are helped by e-tutors will not benefit from the ideals set for the design process, where the focus is on labour markets and inventive abilities from design process students in particular, to see who must benefit from being taught in a virtual context.

The paper's aim revealed certain undesirable consequences, which were reported with an indicator that resulted in a less favourable evaluation on the construct. The ability of e-tutors to conceive the make prototype stage of the design process was revealed.

This research was carried out at an ODeL institution with a global student population of 300,000 students. Out of the whole student population, this study concentrated on 350 postgraduate students who registered for a module (n=500), which proved to be a constraint. Another issue was that, despite the fact that this article focuses on a single college, the same ODeL institution positioned its qualifications across seven colleges and institutions. Despite the fact that departments teach a wide range of modules, the fact that this research focused on only one institution and one module within a department exacerbated the constraint. Because just five e-tutors participated in this study, the institutional professional plan for e-tutors provides for e-tutors across the institution, colleges, and departments, which might be deemed a large number of e- tutors. An instrument became a limitation because it was produced and used as a practical tool for a certain objective. The document then featured a list of restrictions, with no indication that the paper would be treated lightly or with little power. Finally, in order to avoid generalizing the findings, it is vital to analyse these restrictions and pay attention to them so that they may be applied to new investigations.

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The data used in this study was confirmed by the researchers that it belongs to the years before 2020.

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