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Collaborative E-Learning Model Development for Increase Quality Learning in Vocational School

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Abstract

The creation of a collaborative e-learning model is an urgent need, especially in Tangerang, to improve the quality of education in Vocational High Schools (SMK). Vocational learning requires integration between theory and practice, but traditional e-learning systems have not been able to meet this need. This study aims to develop a personal collaborative e-learning model that combines interactive support-based learning, context-based collaboration, and practice-oriented learning. The research methodology uses the ADDIE model with a Research and Development approach. The subjects of the study involved 22 teachers and 375 students from various vocational schools in Tangerang. Data collection was carried out through questionnaires, observations, interviews, and test results, with three trial classes for one semester. The results showed that the collaborative e-learning paradigm significantly increased student engagement, learning quality, and learning outcomes. As many as 82% of students felt their learning experience was more meaningful than the previous e-learning method, while 85% of students actively participated in discussion forums and collaboration. The test results showed an average increase in scores of 15%. Teachers also assessed that this strategy supports the development of students' practical skills and facilitates project-based learning. Satisfaction evaluations showed that 80% of students felt more satisfied with the learning experience using this collaborative model. The collaborative e-learning model developed is not only relevant for learning in SMK Tangerang, but also has the potential to improve the standard of vocational education in Indonesia. Training and infrastructure support are needed to ensure the sustainability of the implementation of this model.

I. INTRODUCTION

Information and communication technologies have changed many areas of life in the current digital age, including education[1]. E-learning is one ongoing innovative development that makes it possible to conduct the learning process online using a variety of digital platforms[2]. Without being restricted by time or location, e-learning offers easy access to course materials and increases the flexibility of teacher-student interaction[3]. Despite the enormous potential of e-learning, there are still several obstacles to overcome before it can be used in vocational education, such as at Intermediate Vocational Schools (SMK)[4].

School Intermediate Vocational Training (SMK) plays a crucial role in print power skilled and ready work use. SMK offers an education that emphasizes both practical skills that are immediately useful in the corporate world and theory[5]. Effective learning in vocational schools, in this setting, requires the ability to integrate theory and practice. Regretfully, a lot of vocational schools still struggle to impart knowledge practically, particularly

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given the restricted facilities and resources now available. Consequently, a more effective approach or sophisticated learning model that is pertinent to the demands of the industrial world is required[6].

Despite being a solution for improving the quality of education, e-learning is still perhaps not widely used in vocational schools, particularly when it comes to meeting the practical needs of students[7]. Current E-Learning Models at this Time Many of these centres on the online delivery of content theoretically, leaving little opportunity for gaining practical skills. This has become a significant difficulty, given that the nature of learning in vocational institutions heavily relies on firsthand experience and fieldwork. To address this difficulty, a more sophisticated interactive and collaborative e-learning paradigm must be developed[8].

The aforementioned restrictions can be effectively overcome by draft learning collaboration. Learning cooperation places a strong emphasis on interactions between students and their teachers, as well as between students and the industrial world in a more practical setting[9]. Students who use a collaborative e-learning model not only passively absorb the material but also actively engage with it, work together, and complete more difficult assignments, which can lead to deeper and more meaningful learning experiences[10].

In light of this requirement, research The goal is to create a collaborative e-learning paradigm that is tailored to the needs of Tangerang Vocational School[11]. It is anticipated that this model will address the difficulties vocational schools encounter in providing effective instruction, particularly in the area of practical skills. It is anticipated that the creation of this model will also maximize the use of technology in vocational education, enhancing the calibre of teacher-student interactions and making learning more engaging and relevant[12].

On the side Yet there are currently a lot of e-learning systems available. This does not yet fully address needs unique to vocational schools, like increased student-teacher engagement and the capacity to immediately access and practice skills[13]. It is anticipated that by implementing an integrated collaborative e-learning model that includes simulation, practical work, and activities, students will be better prepared to enter the workforce[14]. In addition, this strategy seeks to foster greater collaboration among students, which will enhance their educational experience[15].

The Collaborative E-Learning Model's Development This is anticipated to have a good effect on SMK Tangerang's quality of instruction[16]. Consequently, the creation of a suitable model with traits and requirements for Students in Tangerang's vocational schools is becoming increasingly significant. To guarantee that vocational education can generate graduates who are capable and prepared to compete in the industrial world. Investigate This study will investigate how the collaborative e-learning paradigm can be successfully implemented in a vocational school setting[17].

To achieve the stated goal, research Both qualitative and quantitative methods are used to gather information from educators, students, and subject matter experts[18]. Combining in-depth interviews, discussion groups, and quantitative survey data, research The goal of this project is to gain a deeper understanding of the requirements, difficulties, and possible application of the collaborative e-learning model at Tangerang Vocational Schools. Furthermore, the research seeks to assess the extent to which the model's development can improve the quality of learning[19].

According to the stated goal, research This method gathers data from students, instructors, and education professionals using both qualitative and quantitative methods. Combining in-depth interviews, discussion groups, and quantitative survey data, research The goal of this project is to gain a deeper understanding of the requirements, difficulties, and possible application of the collaborative e-learning model at Tangerang Vocational Schools. Furthermore, the research seeks to assess the extent to which the model's development can improve the quality of learning[20].

One of the biggest problems in the field of vocational education is how to combine theoretical knowledge with practical skills that can be used in the workplace[21]. Practical skills become crucial in vocational schools, given that the primary goal of vocational education is to ensure that pupils are prepared to work in the sector. However, much like with technological advancements, learning in vocational schools is challenged by new issues and requires the employment of more techniques to meet contemporary demands[22].

One of the suggested answers is to include technology, specifically e-learning, in the educational process. However, the truth is that there are currently a lot of e-learning platforms available, even though e-learning offers several benefits, such as flexible access to material learning. The foundation of vocational education is a greater emphasis on learning theory and less space for practical skills. This is one of the primary issues that many Indonesian vocational schools that use e-learning to its fullest extent encounter[23].

In this situation, an e-learning model is required that not only offers theoretical content but also enables students to participate in collaborative, hands-on learning. Collaborative learning, which prioritizes work between teachers and students, is anticipated to improve strategies for dealing with difficulties. This collaborative e-

learning model is excellent. Can make space for students to study by interacting, talking, and working together with classmates, teachers, and professionals in the field[24].

However, the truth is that there are still a lot of vocational schools without an acceptable and successful e-learning strategy. For instance, in SMK Tangerang, despite the use of technology in the classroom, current e-learning models are unable to meet the needs of students in terms of practical, need-based learning skills and teamwork[25]. This may lessen the effectiveness of learning and restrict the skills that students can acquire, making them less prepared to enter the workforce[26].

On the other hand, the value of practical learning skills becomes more evident, particularly in the increasingly industrialized world where people need to be able to work with abilities related to technical matters. Therefore, the creation of e-learning models that can meet the requirement for more collaborative and practical learning is essential to improving the quality of education in vocational institutions. In addition to enhancing the educational process, this approach will benefit high-calibre graduates who are prepared to enter the workforce[27].

It is anticipated that the implementation of suitable collaborative e-learning models with the demands of Tangerang Vocational School will prove to be an effective option in overcoming current constraints. By making the best use of technology, this model can improve teacher-student communication, make learning more applicable in real-world situations, and make learning more interactive. Additionally, this concept can help students work together, which will enhance their experiences. Learn them and develop social skills that are highly valued in the workplace[28].

It is not possible to build and execute the Collaborative E-Learning model negligently. To determine the needs of Tangerang Vocational Schools in particular and the difficulties encountered in implementing e-learning, a thorough investigation is necessary. With improved knowledge of the actual conditions in the field, the model created is anticipated to be able to set more realistic goals and deliver the best outcomes for students, instructors, and all parties involved[29].

Therefore, the goal of this project is to create a collaborative e-learning model that may improve the quality of instruction at Tangerang Vocational School and maximize the use of technology in vocational education. It is anticipated that the creation of this model will significantly improve the quality of education in vocational schools and assist in preparing graduates to meet the demands of the industrial world[30].

One approach that has shown positive results is the collaborative e-learning model. This model integrates technology with active team-based learning, which not only improves students' technical skills but also encourages collaboration, communication, and adaptation to real-world work environments. By synergizing collaborative and pedagogical elements, this e-learning model offers a relevant solution to improve the quality of vocational education in Indonesia, while bridging the needs of the industrial and educational worlds. This approach also has the potential to expand access to quality learning in various regions, thereby supporting the equalization of the quality of vocational education throughout Indonesia.

II. RELATED WORKS/LITERATURE REVIEW

A. E-Learning Concept in Education

E-learning or education Electronic learning is a method of instruction that makes use of technology to provide resources, direction, and virtual communication between educators and students. Rosenberg (2001) asserts that e-learning encompasses not just the online transmission of content but also interactive procedures that facilitate communication and learning remotely. E-learning offers students time-permitting flexibility and ease of access in context education. Use digital platforms to work with friends and teachers in addition to studying independently[31].

B. Vocational Education and Its Challenges in Using E-Learning

The features of vocational education differ from those of general education, particularly at the School Intermediate Vocational (SMK) level. Vocational education places a strong emphasis on developing skills that apply to the workplace. As a result, the learning process requires a strategy that is grounded in both theory and practice[32].

The integration of technology into practical instruction is a significant challenge for vocational institutions. The primary impediment is the lack of specialized e-learning models that require practice, as well as limitations in terms of tools and facilities. Thus, an e-learning approach that can support the need for direct, interactive, and practical instruction is required. To assist students in gaining practical experience in the workplace[33].

C. Learning Collaborative in E-Learning

Collaborative learning is a method of instruction that entails student participation to achieve learning objectives in a group setting. Johnson and Johnson (2004) claim that learning collaboratively not only improves comprehension but also fosters the development of social skills including problem-solving, communication, and teamwork. In the e-learning context, collaborative learning has become increasingly important since students may work together online, exchange ideas, and discuss and learn from one another[34].

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D. The Influence of Collaborative E-Learning on Quality Learning

The collaborative e-learning model allows students to collaborate, work together, and share knowledge online, all of which improve the quality of learning. Collaborative e-learning approach can improve student happiness, learning outcomes, and the quality of interactions between students and teachers. According to the aforementioned study, the collaborative E-Learning paradigm is also thought to be successful in improving students' comprehension of the information being learned through online participation and assisted discussions[36].

The collaborative e-learning paradigm aids students in developing non-technical abilities that are crucial in the workplace, like problem-solving, communication, and work ethic. This approach encourages students to take an active role in their education, which ultimately improves their comprehension of the subject matter and equips them to handle obstacles in the workplace[37].

E. Need for Customized E-Learning Models for Vocational School

E-learning models at this time This isn't yet tailored to the features of vocational schools that demand a harmony between theory and practice. A suitable e-learning model for vocational schools should be able to support the practical teaching of skills through simulation or student collaboration in activities that are similar to those in the practice field. Research indicates that project-based and simulation-based learning For vocational education, collaborative e-learning may be the best option[38].

Customized models are also essential for fostering close communication between students and professors and providing opportunities for students to contribute pertinent work-related experiences and information. Asserts that components like video lessons, virtual practice sessions, and discussion groups are essential to an efficient e-learning strategy for vocational schools. Therefore, it is anticipated that creating a personalized collaborative e-learning model with an SMK context will improve quality and make learning more applicable[39].

E-learning appears to have a lot of promise for assisting the learning process at different educational levels, according to the review library. However, e-learning must be implemented in a context-specific, more needs-specific manner in vocational education, particularly when it comes to teaching practical skills. There is a significant chance to improve the quality of learning through extensive contact and collaboration with the collaborative e-learning model created specifically for vocational schools. The same is true for students[40].

Examine This attempt aims to close a gap in the literature by creating and implementing specialized collaborative e-learning models with occupational context education at SMK Tangerang. Therefore, it is anticipated that the study Through more collaborative, participatory, and practical learning paradigms, can actually help to improve the efficacy of instruction in vocational schools[41].

III. METHODS

A. Approach Study

Examine The goal of this research and development (R&D) approach is to create a suitable collaborative e-learning model for students at SMK Tangerang who require special education. The R&D research approach was selected because it enables researchers to not only identify current issues and needs but also create, implement, and assess new products that the educational institution can employ[42].

B. Design Study

Examine This employs the five-stage ADDIE approach for design development. Analysis, design, development, implementation, and evaluation are the main components. The ADDIE model was selected

because it is methodical and enables an organized process in product learning development, allowing for adequate measurement and evaluation of the outcome[43].

C. Stage Study

a. Analysis of the Stages At this point, the study is carried out using observations, interviews, and questionnaires distributed to SMK Tangerang's teachers, students, and vocational education experts. Analysis's objectives This is to identify features of learning that are sought collaboratively and to comprehend the needs and obstacles of implementing e-learning in vocational schools. Additionally, both qualitative and quantitative data were gathered to provide a detailed description of the needs of teachers and students in collaborative e-learning[44].
b. Stage Design: Create the initial collaborative e-learning models based on the results of the analysis. At this point, planning is done to identify the model's structure, the collaborative work that is needed, the types of materials that are needed, and the learning activities that are acceptable for vocational education in SMK. Create This includes the view interface, flow, and module. Work on a potential e-learning platform where students can collaborate and communicate with teachers[45].
c. Stage of development, Following design approval, stage model development is completed by creating a collaborative E-Learning model prototype that involves the interface of programmers and designers. The primary features that have been created include discussion boards, virtual workspaces, task sharing, and a collaborative evaluation function. In addition, exercises and materials for collaborative learning were produced to assess the efficacy of this strategy. After developing the prototype, it was tested on a limited scale to find any technical errors or areas that needed repair[46].
d. Stage Implementation, Model that has been developed and implemented in several selected Tangerang Vocational School class as class example. Teachers and students in the class received brief instruction on how to use collaborative e-learning platforms. Execution This was carried out over a semester to gather empirical evidence regarding the efficacy of collaborative e-learning models in the educational process. Throughout the deployment phase, live observations, interviews, and questionnaire distribution To find out how teachers and students react to this model[47]
e. The purpose of the stage assessment is to gauge the effectiveness of the collaborative e-learning paradigm that has been used. The information gathered through observation, questionnaires, and interviews was examined to determine how well the model increased the quality of learning, particularly for cooperative students, who had practical skills and understood the material. Based on this evaluation, the model will be refined and enhanced by user input[48].

D. Subject Study

Subject study This is the instruction of SMK Tangerang's pupils, instructors, and specialists. Purposefully selected sample based on project- or collaborative learning experience, as well as requirements for students and teachers participating in e-learning. The entire sample utilized in the research comprises 15 teachers and 100 students from five Tangerang vocational schools who are using the E-Learning platform to learn.

E. Instruments Data collection

Instruments used in the study This includes :

a. Questionnaire To collect quantitative data related to responses from students and teachers towards the effectiveness of collaborative E-Learning models[49].
b. Interview To get qualitative data from students and teachers regarding their experience in learning collaborative through the E-Learning platform[50].
c. Observation For observing the interaction between students, as well as between students and teachers during learning ongoing[51].
d. Test results Study For measure improvement understanding student after using collaborative E-Learning model[52].

F. Data Analysis Techniques

Data collected analyzed use method analysis qualitative and quantitative :

a. Quantitative Data: Data from questionnaires and test results Study analyzed using technique statistics descriptive and inferential To know the influence of the model on improvement results learning. Analysis This is done with device soft statistics like SPSS to ensure accurate results[53].
b. Qualitative Data: Interview and observation data analyzed using technique analysis thematic. The data obtained from interviews and observations will categorized into themes To make it easier to interpret and

conclude How experience and feedback students and teachers regarding the collaborative E-Learning model that was developed[54].

G. Procedure Model Validation

Model validation is performed through validation experts and the trials field. Collaborative E-Learning model developed and validated by experts in education and technology education To ensure the model meets required standards. After that, a trial was conducted on a scale small in one class pilot. The bait comes back from students and teachers during the trial used To improve and refine the model[55].

IV. RESULTS

A. Analysis Need Learning Collaborative in Vocational School

To get a description of overall knowledge and understanding of Party School in matter Head School about Collaborative E-Learning School Intermediate Vocational in Tangerang Area.

TABLE 1
NEED LEARNING COLLABORATIVE IN VOCATIONAL SCHOOL

No	Question Items	Yes	No
1	Is there any school that has an E-Learning platform that is accessible to students and teachers?	18.2%	81.8%
2	Is there any party school needs to use E-Learning at this time	18.2%	81.8%
3	Do all students and teachers have access to the E-Learning platform?	18.2%	81.8%
4	Is there an E-Learning platform that has complete features To support the learning process online?	59.1%	40.9%
5	E-Learning Allowed? help improve the teaching and learning process	68.2%	31.8%

Data source SPSS Version 26 Management (2022)

In Table 1 Need for Collaborative Learning in Vocational Schools it is explained that The results of the questionnaire and interviews with principals in several vocational schools in Tangerang in Table 1, found that most schools showed that most schools (81.8%) did not yet have digital infrastructure to support collaborative learning, which was a major obstacle in implementing E-Learning. This finding confirms that collaborative E-Learning requires a special model that allows students to collaborate in solving problems and working on practical projects. Therefore, the important collaborative component in the E-Learning model in vocational schools is the basis for developing the model in this study.

B. Development of Collaborative E-Learning Model.

Table 2.
Development of Collaborative E-Learning Model in Vocational Schools

No	Question Items	Yes	No
1	Have you ever You using the E-Learning platform Collaborative before This?	3.7%	96.7%
2	Is there any You Understanding E-Learning Collaborative?	4%	96%
3	Is there any experience available for learning collaboratively?	6.7%	93.3%
4	Is there any You feel that the E-Learning platform provides variation sufficient learning, such as video, audio, images or text?	4.8%	96.2%

Data source SPSS Version 26 Management (2022)

Results of Collaborative E-Learning Model Development in Vocational Schools in Table 2 , based on analysis needs, the collaborative E-Learning model developed its Features main like :

a. Discussion Forums and Groups Collaborative For allow students each other communicate and work The same is true for task projects.
b. Feature Share Tasks and Feeds Possible return student For upload task, review task Friend class, and give bait come back One each other.
c. Session Virtual Practice uses media such as video tutorials or simulations that imitate the environment Work really To fulfil needs skills practical.
d. Development of this model through trial and revision phase based on bait come back from students and teachers in the class pilot project. Teachers are also trained To use this platform so that they are more capable of facilitating learning collaborative.

C. Implementation and Use of Models

Table 3.
Activities Collaborative

No	Question Items	Very No agree	No Agree	Except	Agreed	Agree very
1	System This is a tool time saving for partnership knowledge.	0.5%	1.6%	11.2%	53.9%	32.8%
2	System This is an effective tool For partnership knowledge.	0.8%	1.6%	9.3%	54.4%	33.9%
3	I am willing to use the system To share my experience with other people.	1.3%	1.9%	11.7%	51.7%	33.3%
4	Other students can use the system To share experiences with me.	1.3%	1.6%	13.6%	54.4%	29.1%
5	I am willing to use the system To share knowledge with other people.	0.8%	2.4%	13.9%	53.6%	29.3%
6	Other students can use the system To share knowledge with me.	2.1%	0.8%	13.9%	51.7%	31.5%

Data source SPSS Version 26 Management (2022)

Collaborative Activity Results Table 3 explains that , Collaborative E-Learning Model This is implemented in the classroom at SMK Tangerang. The results of the implementation show an improvement involvement of students in learning.

Questionnaire results show a very attitude positive to system sharing knowledge For the activity collaborative, with majority of Respondents confessed efficiency, effectiveness, and willingness as well as other students to use the system. However, some areas such as trust in the willingness of other students to share their experience and knowledge need to be reinforced To increase trust as well as the involvement of all parties.

Questionnaire data show that 85% of students feel this model gives experience learning more meaningful compared to with method Study previously tended to be individualistic. The teacher also observed improvement skills in social students, such as Work and the ability to think critically, which is very needed in the world of work.

D. Measurement Results Model Success

Table 4
Characteristic features Student

No	Question Items	Very No agree	No Agree	Except	Agreed	Agree very
1	I believe in using systems To gather useful knowledge.	5%	2.1%	12.5%	53.1%	31.7%
2	I believe in the use of systems For sharing knowledge.	1.3%	2.1%	14.4%	51.7%	30.4%
3	I believe use function systems To get information-taking workers.	1.1%	1.6%	14.7%	53.3%	29.3%
4	In general, overall, I have believe For use system This	1.1%	1.3%	11.2%	58.7%	27.7%

Data source SPSS Version 26 Management (2022)

The results of the Student Characteristics in Table 4 explain that , Measurement success of the model is carried out through an evaluation questionnaire to the satisfaction they in learning. Data shows that students who follow the collaborative E-Learning model own higher average value high (around 15%) compared to with students who use learning conventional. Besides that, the resulting questionnaire shows that 80% of students feel more satisfied with the experience of learning using a collaborative model.

Survey results show that the majority of students believe tall in using the system, is good For gathering knowledge, sharing information, as well as getting information about opportunities Works.

V. DISCUSSION

Research result This shows that the collaborative E-Learning model was developed and has give impact positive to quality learning at SMK Tangerang. The success of this model especially due to his ability To provide a receptacle for students to work together, discuss, and learn through experience practical. Improvement results Studies show that collaboration and engagement in learning can increase the understanding of students of the material.

In context education, this model is also successful in fulfilling needs specifically for vocational schools, where learning practice and collaboration are very important. Students feel more Ready to face challenges in the world of work Because of skills social and practical they trained through this model. Teachers also feel helped by the existence of monitoring and feedback features in this model, which allows them To give more guidance to need students.

The results of the implementation of the Collaborative E-Learning model at SMK Tangerang showed significant improvements in several aspects of learning. This model succeeded in: Improving Understanding of

Material Collaboration helps students complement each other's lack of understanding, Training Collaborative Skills and Practical skills relevant to the world of work, Encouraging Active Participation especially when they feel that their contribution has value to the team. Although the results of the implementation of this model are quite positive, several obstacles arise in student collaboration: Lack of Confidence in Sharing, Ability Gaps Between Students, Dependence on Technology

Solutions to Increase Student Confidence in Sharing Experiences; Creating a Safe and Inclusive Environment is done by implementing class rules that encourage mutual respect, Facilitating Tiered Collaboration This gradual approach can increase student confidence gradually. Encouraging Reflection and Positive Feedback guides them to see the value of the shared experience, Flexible Use of Collaborative Technology anonymity can be reduced as students feel more confident, Increasing Non-Formal Social Interaction helps students feel more comfortable sharing experiences in a less formal setting. This implementation accompanied by constraint management shows that Collaborative E-Learning not only improves learning outcomes, but also builds a stronger culture of collaboration among students.

The Collaborative E-Learning model offers a different approach compared to conventional e-learning which focuses more on individual learning. In conventional e-learning, students tend to learn independently through learning modules or videos, with little or no interaction with peers. In contrast, Collaborative E-Learning integrates elements of active interaction and collaboration between students, which provide several advantages: Active Interaction and Participation, Improved Social and Collaborative Skills, Contextual Approach

In Indonesia, Collaborative E-Learning not only answers the challenges of conventional e-learning, but can also be adapted from international practices such as in Finland and Singapore. However, its implementation requires adjustments to overcome local constraints, such as the technological gap and teachers' digital competencies. Lessons from international studies show the importance of collaboration between schools, government, and industry in ensuring the successful implementation of this model. By combining local results and global insights, Collaborative E-Learning has the potential to become a superior learning model that is not only relevant nationally but also competitive internationally.

VI. CONCLUSIONS

Based on the research results, it can be concluded that the Collaborative E-Learning model developed has proven effective in improving the quality of learning in Tangerang Vocational High Schools. This model successfully facilitates collaboration between students, improves understanding of learning materials, and trains practical skills that are relevant to the needs of the world of work. This makes the Collaborative E-Learning model a potential solution to overcome limitations in learning practices in vocational schools through digital platforms.

The discussion and results of this study show the main findings regarding the effectiveness of the Collaborative E-Learning model which includes improving students' ability to work in teams, problem solving, and application of knowledge in real situations. The empirical results of the study support that this approach can be applied in various vocational programs to strengthen the connection between the school curriculum and industry needs.

With the success that has been achieved, this Collaborative E-Learning model can be adopted more widely in other vocational high schools in Indonesia to support the improvement of the quality of vocational education as a whole. Further research is recommended to evaluate the impact of this model on various educational contexts and social environments, as well as to optimize the development of the model based on the specific needs in each region. Through continued adoption and innovation, this model is expected to be a catalyst for more inclusive and relevant vocational education in the digital era..

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