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"EXPLORING THE EFFECTIVENESS OF VIRTUAL CLASSROOM PROJECT (VCP) IN FACILITATING STUDENT LEARNING: A COMPARATIVE STUDY OF CONVENTIONAL CLASSROOM AND VIRTUAL CLASSROOM ENVIRONMENTS"

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Abstract

This exploration looked at the exhibition of understudies taking a web-based math course to that of understudies doing a customary study hall based course. While there are several methods for tracking students' progress in online learning environments, actual comparisons of the various learning strategies are still uncommon. This examination gives an immediate correlation of e-learning and study hall guidance by and by to close this hole. A fifth of them signed up for the essential math's course. We restricted our trial to the gathering of understudies concentrating on designing to have a homogenous understudy populace. 130 students volunteered to take part in the research. They were split into two groups at random before the course began. The first group received instruction through face-to-face lectures. The second group took a math course online. The same subjects were covered by all pupils in a variety of ways. The online primer course Online Mathematics served as the e-learning platform. The review's objective was to decide whether there is a recognizable distinction in execution between understudies utilizing an e-learning framework and the people who are given guidance through a conventional talk style. To gauge the kids' achievement, many evaluations were made. Likewise, an overview that was regulated at the finish of the course empowered the understudies to offer their viewpoints on how they had an outlook on the examination. Our discoveries demonstrate that in this case, eye to eye guidance was more compelling than the e-learning style. The pupils in the control group's average performance greatly improved, but this was not the case for the e-learning group. In our case, using an e-learning programmer resulted in noticeably poorer results. While we do not imply that the findings are generally relevant to users of e-learning applications, we do highlight the most important variables and the required adjustments for effective e-learning.

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1. Introduction

The present educators use virtual study halls to duplicate a well-established practice, i.e., to teach similarly as they would in a conventional homeroom. More often than not, this is unequivocally the very thing understudies expect, which makes a horrendous circle for utilizing virtual homerooms. While there is innovation that considers virtual study halls to go past regular (up close and personal) instructive settings and to incorporate practices that can't be done in a conventional homeroom, this isn't true and it will probably require an additional years for it to turn into a broadly utilized practice. At the point when another innovation is carried into an industry with well-established practices and customs, numerous circumstances closely resemble this one. For instance, the film business has taken a similar strategy. Despite the fact that the first pictures were made in 1890, all of the early films imitated theatre, which audiences and performers had been familiar with for generations. As a result, the early movies were shot using stage-bound cameras, the performers performing on stage, which is what they were greatest at before movies, and the scenes were thought to flow chronologically. The "Great Train Robbery," which was originally shot in 1903, exposed the audience to location filming with events occurring continuously at the same time but in separate locations. This was the first motion picture to properly explore some of the promise that the new medium might provide. All of the films took a long time to adjust to these procedures, which are now standard in the industry.

1.1.Virtual classrooms for eLearning

Since Chambers proposed that remote learning trials be carried out in a manner that might support in-house learning for certain educational resources in 1980, networked computers have been used to improve learning. In 1986, Hiltz coined the phrase "virtual classroom" after describing the usage of a computerized conferencing system as such. The early utilizations of virtual homerooms focused on functional worries, for example, sound and video and utilization of a "pencil" for the whiteboard, though the essential hardships noted were associated with confined transmission capacity and absence of "turn-taking". A few internet based coordinated learning innovations have emerged, giving choices to virtual study halls, as video conferencing innovation has created and developed. Most of settings included conveniences like live voice and video, a whiteboard, slide introductions, text-based intelligence, and ways for understudies to give remarks.

The requirement for simultaneous remote realizing, where an instructor needed to reenact a regular homeroom for distance understudies, was what first spurred the introduction of virtual classrooms. The fundamental objective in these early instances was to provide students with an encounter that was comparable to one in a traditional classroom. This frequently fizzled inferable

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from organization and gear gives that brought about sound and visual issues, as well as because of an absence of OK instruments (for example a conversation organization highlight). Zero in was put on the climate's ease of use and quality as new conditions added more highlights, leaving the sound and visual issues before.

Virtual classrooms may be used for blended learning, on-campus courses or even as a standalone option for distance learners. Synchronous communication between distant learners may now be employed in a virtual classroom to better encourage individual engagement, elicit arousal and motivation, and help in the development of a learning local area and the counteraction of estrangement, which is contrarily associated with study hall local area. Tasks that require group cooperation in a virtual classroom improve student abilities and learning efficiency. There are several capabilities available in modern virtual classroom settings that might be used to go beyond the constraints of the conventional classroom in addition to simulating it.

This essay contends that while virtual classrooms have the potential to go beyond the constraints of conventional classrooms, their use is nevertheless constrained by "tradition," much like the paradigm of the film industry. The part that follows contains a quick assessment of the research on virtual classrooms in order to make this point. The encounters and best practices from using virtual homerooms to either imitate customary ones or to attempt to go past the imperatives of conventional study halls are introduced in chapter 3. In Section 4, a qualitative research including interviews with 21 instructors who are professionals in utilizing virtual classrooms for higher education shows that even they do not completely use these capabilities. Section 5 concludes by summarizing the paper's principal conclusions.

2. LITERATURE REVIEW

Study on "Preparing faculty for instructional technology: from education to growth to creative freedom" was conducted by Karen L. Smith in 1996. In order to create student-centered learning environments, this article examinations a preparation and backing foundation that includes new clients of educational innovation in a recursive course of exploration, plan, improvement, and assessment. The success of this method of faculty development has been largely attributed to the provision of teachers with the knowledge and skills that enable them to function independently, to the facilitation of access to resources and support staff, and to the establishment of new evaluation and reward systems that take into account the importance of instructional technology in the teaching process.

Virtual College reference model: a manual for giving schooling and backing administrations to the far off understudy was the subject of research by Aoki et al. in 1998. They claim that the phrase "virtual university" has been abused without giving its definition the proper consideration. The phrase is often used to refer to online courses, or courses delivered remotely over the

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Internet. Some people have used the phrase to refer to electronic databases of online courses, often known as online course catalogues. In this concept, managerial administrations, understudy administrations, asset administrations, and faculty services are the four main divisions of a virtual university. Each component serves a unique role and offers various benefits to students.

The "A model of Virtual University" was put up by Stein (2000). This article seeks to describe the components, organization, and workflow of a virtual university. The ability to communicate globally "online" has been made possible by the potential of communication networks and media, and this chance may be leveraged in education. Education promotes cost-effectiveness and offers an efficient educational process in this manner. The approach aids in the analysis of critical information and connections between it in a virtual university. It promotes the decision-making process. The work team, student profile, student activity, communication channels, organization, specific viewpoints, the aims, and history of distant education are some of the crucial components of this approach. The provided model aids in the analysis of crucial details and their connections in the Virtual University. It encourages the process of decision-making, the form of Virtual University and the kind of courses which lead to "substantial effect when viewed as an option for the enhancement of education quality in areas with poor economic resources".

A study on "Modeling course for the Virtual University by features" was conducted by Horváth et al. in 2001. While the modeling is being created for the field of higher education in virtual technologies, this research claims that it may be used universally. The study presents several ideas linked to virtual universities as well as the writers' perspective on these institutions. These are the models: Model of virtual course that makes use of the organization of its components, feature-driven module development, and associations between course components. And when their instances are created, generic models are utilized. The authors have put up a paradigm that they hope will help realize the ideal of the virtual university. The goal is to create a virtual university that can educate engineering design using virtual technology. The functions in the proposed virtual university paradigm are managed by functional managers. Topics are used to model modeling methodologies.

A study on "Successful Implementation of e-Learning Pedagogical Considerations" was undertaken by Govindasamy in 2002. To establish a fruitful e-learning climate, it is critical to comprehend the instructive ideas that underlie the educating and learning exercises. Pedagogical principles are the ideas that guide effective teaching practices. In terms of e-learning, the author contends that Instructional Technology adequately reflects appropriate teaching or instructing practices. The author has proposed five criteria for educational attributes: creating material, managing content storage and management, packaging content, providing help for students, and evaluation.

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An e-learning maturity model was investigated by Marshall et al. in 2002. What is required, according to the authors, is a process model that promotes the creation of efficient educational technology resources that are not reliant on certain organizational, pedagogical, or technological frameworks. This study examines the benefits of adopting the Capability Maturity Model, an existing process model in the field of software engineering, in an attempt to create such a model (CMM). The article gives a general introduction of the CMM and explains how it may be used in the field of online learning. It analyses two potential uses for it: as a guide to enhancing course level e-learning adoption and as a guide to institutional e-learning adoption and integration. The potential benefits and drawbacks of utilizing a modified version of the CMM for online learning are discussed in the paper's conclusion.

Open and remote learning: trends, policy, and strategic issues was the topic of a study by Moore et al. in 2002. Open and distance learning is one of the fields of schooling that is growing the quickest, as per the review's discoveries, and the advancement of Web based data innovations, especially the Internet, has greatly heightened its potential impact on all systems of education delivery. The emphasis of attention has begun to change as ICT usage in education has advanced from an initial focus on the skills and abilities related to the technology itself to an engagement with the potential for ICT to function as a catalyst for the creation of new forms of teaching and learning (Denning et al, 2003). Each new wave of technology draws on many media, teaching philosophies, and curriculum, continuously producing new applications and educational paradigms (Greenberg, 2004).

3. METHODOLOGY

We contrast an online e-learning platform with the conventional classroom teaching method. The research was conducted using RWTH Aachen University's fall 2015 introductory mathematics course. Basic mathematical subjects including linear equations, integral calculus, and analytic geometry are covered in this course. Over 1,800 potential students from a range of academic fields routinely enroll in the course, which is presented annually. In order to conduct our experiment with a homogenous population, we only invited engineering students to participate. 131 of the course's enrolled students consented to participate in the research.

3.1.E-Learning Platform OMB+

The conventional technique for homeroom guidance utilized in the course was stood out from the on the web mathematics bridge course offered by Online Mathematics Brückenkurs OMB+1. Eleven German institutions collaborated with the business integral-learning GmbH to create the ideas and materials. The online application is recommended for use in preparing for studies by more than 20 German institutions. The Web-based Numerical Scaffold Course OMB, which was utilized in Germany for various years, was followed up by the OMB+.

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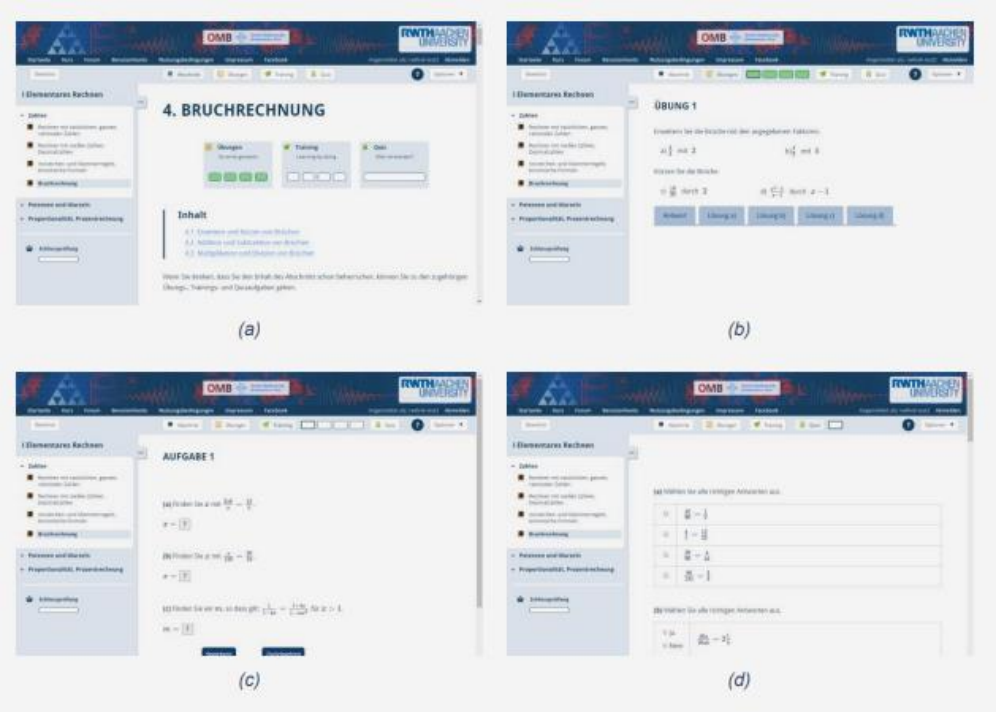

Figure 1 Screen capture of different OMB+ features

OMB+ platform screenshots are shown in Figure 1. The header of the page, which incorporates the route bar with connections to the landing page, the course, a board, and different destinations, is found at the top. Moreover, the various practice kinds may be chosen. The many subjects are selectable on the left. The platform includes 10 distinct chapters in total. Each is broken up into many portions. The fourth subject in the principal area ("Zahlen") of the main section ("ElementaresRechnen"), "Partial Math," is picked in Figure 1. Figure 1a portrays the subject's early on page. The topic's title and the available practice options—exercise ("Übung"), training, and quiz—are presented at the top of the page. The understanding about the subject is provided on the first page. The content is presented in a textbook-like manner. Interactive components like movies are spread over many pages as well. The exercise is shown in Figure 1b. The reader is given a variety of tasks to do, and they may click to discover the solution. The user's involvement is not needed for this phase. There are more arithmetic issues in the training part as shown in Figure 1c. The training is broken up into many categories, each of which comprises a certain kind of challenge. The learner is supposed to complete the questions' responses, after which they may verify that the response is accurate. The quiz, the last exercise for the subject, is shown in Figure 1d. The reader is presented with a variety of activities and questions on this page. The various issue types are combined, as opposed to the training part, where they are separated. After responding to the questions, the user may see which responses are accurate and, in certain situations, get information explaining why the response is incorrect and suggestions for

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how to change it. The final exam question type is an extra question type. One final exam that includes questions from every one of the chapter's parts may be created for each of the 10 chapters. The student is permitted to retake the test, but new questions will be given if he fails. The OMB+ did not completely replace the mathematics course, as we will explain in the paragraph that follows. As a result, the pupils did not usually employ the final method of learning.

The taking part understudies were randomized into two gatherings at irregular to contrast the e-advancing course and the conventional learning procedure. In the training examples, the OMB+ was utilized by the primary gathering. The benchmark group concentrated on in an ordinary study hall setting. It is intriguing to take note of that the internet based stage didn't totally supplant the course. Simply a piece of the talk was snubbed by the OMB+ since not each of the components of the e-learning stage was like the materials presented in the course. These components did not, however, add to earlier ones. The pupils received their education in a classroom setting for the remaining courses. The online course was used to replace the following five units.

Integral calculus, Differential calculus, Analytic Geometry, Fractional Arithmetic, Percentage Calculations, Interest Calculations, Solutions of Equations and in Equations

Several assessments were given to each student to evaluate their success. Prior to the commencement of the course, the first exam was given to gauge the students' prior knowledge. This number simulates a student's prior performance. Afterwards, an evaluation was done for each of the five subjects using questions relevant to the industry. After every lecture, these examinations were completed on paper and with a pen. The student's performance during the course is modeled by the average of these five evaluations. The learning influence is shown by the change between the pre-course test and the normal. In addition to evaluating their performance, we also asked them to respond to a survey regarding the research following the course. It included questions regarding how the course was perceived, how satisfied people were with it, and how they used the online learning platform OMB+.

3.2.Limitations

Our research has several limitations that should be acknowledged, as with any study.

- At first, over 131 students volunteered to participate in the research. Just 51 pupils' data could be utilized due to the low participation rate. While the information was adequate as far as we were concerned to make the inferences we did, the discoveries ought not be extrapolated.

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- Moreover, we cannot ensure that the control group and the e-learning group are made up of the same individuals. The placement of the pupils in the groups was random. The tiny class size, however, makes it totally conceivable that the gatherings didn't precisely mirror a cross-part of the relative multitude of students.
- While all teachers were made mindful of the examination, we couldn't watch out for them all through the talks. Both the classroom lectures and the exercises for the online courses were under supervision. Of course, the human element of the instructors' conduct might have affected the study's findings.
- The kids' engagement and motivation are a last consideration. Several students said that they were very distracted during the study. This variable could affect the outcomes, but it is undoubtedly closely tied to each student's level of focus, motivation, and distraction. Even if they were physically there, students may have done other things except participate in the online course, like browse the web.

4. RESULTS

37 of the 131 students who agreed to take part in the research never showed up for the class. They could have altered their plans or discontinued the initiative altogetherSeveral of the remaining pupils took part in the exams only occasionally. As a consequence, only 51 pupils' data records could be examined. In the e-learning group, there were 27 people. The control group consisted of the last 24 pupils. These pupils all took part in the first exam and at least four out of the five evaluations.

4.1.Performance of students

One evaluation was completed before to the course, and five more were completed throughout it, as stated in Section 3. Table 1 displays the findings for both learning groups.

		Performance		
Group	**Students**	**Pre-course**	**Avg. assessments**	**Difference**
Classroom	25	45.5%	56.2%	+8%
E-learning	26	42.3%	45.2%	-1.4%

The performance of the classroom students increased from 45.5% on the pre-course exam to 56.2% on the assessments. In contrast, the e-learning students achieved 45.2% on the examinations and a pre-course test score of 42.3%. As a result, although students using e-

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learning did not significantly enhance their average performance, conventional classroom students saw an 8% improvement.

Figure 2 shows the outcomes for each individual student. The pre-course test results are displayed on the abscissa. The found the middle value of results of the five assessments is displayed in the ordinate. The pattern line for the regular study hall bunch is displayed on the blue diagram. The pattern for the understudies utilizing e-learning is found in the orange chart. The two diagrams are clearly moving since this shows that understudies who fared better compared to others on the passage level test are likewise bound to improve on the accompanying tests, as well as the other way around. The distance between the graphs is the diagram's most intriguing finding. The face-to-face learners' graph outperforms the e-learning students' graph by a wide margin. This shows that participants in e-learning underperformed those in classroom learning. It is imperative that the scattering of e-students is a lot bigger. While the pattern line for e-learning has a connection coefficient of 0.63, the top diagram's (study hall) is 0.80. There are several outliers both in and out.

Welch's t-test, which is ideal to test a speculation when tests have lopsided changes and test sizes, was used to determine statistical significance [20]. The outcome indicates that our data are statistically significant.

4.2.Student satisfaction

In addition to assessing performance, we also polled the class's participants on their opinions of the course's substance and overall satisfaction. For this study, the questions were translated from their original German into English. Of the 27 participants in the online course, 22 provided answers. In certain circumstances, the responses were optional, thus not exactly expected answers were accommodated a few inquiries. Nineteen inquiries with three thing decisions and four free text questions made up the overview. Several of the questions had more to do with organizational issues or other aspects of the course than they did with the subject. The answers to the questions deemed pertinent to this research are shown in the section below.

Question	Agree	Undecided	Do not agree
Interactive images helped	45%	35%	8%
More interactive visuals please	35%	32%	9%
More examples would help	50%	56%	15%
The explanation text needs more embedded tasks	36%	45%	12%
Explanations sufficed	32%	25%	6%

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To gauge overall course satisfaction, five further questions were posed. The queries and responses are shown in Table 4. According to the findings, scarcely 33% of the understudies accept that the OMB+ application assists them with getting ready for their classes. A little over half of the students said they wouldn't suggest the OMB+ to others. Three-quarters of the participants said they would have learnt better in a regular course and that OMB+ did not adequately replace traditional classroom learning.

Question	**Agree**	**Undecided**	**Do not agree**
OMB+ prepares studies.	45%	35%	8%
OMB+ aids studies too.	35%	32%	9%
I suggest OMB+	50%	56%	15%
It replaced classroom activities	36%	45%	12%
I suggest OMB+ since it replaced classroom activities	32%	25%	6%

Students might insert free text in addition to the pre-provided questions to offer specific feedback. There were thirteen pupils that used it. The information that the students filled out is summarized in the sections that follow.

- Three pupils said there was a lot of distraction.
- Three students accused the OMB+ for failing to explain why a submitted response was incorrect.
- Two students said the OMB+ was useful for reviewing or expanding their prior math knowledge, but not for learning arithmetic from scratch.
- The OMB+ would have been useful for two students in separate locations.
- A student complained that it was difficult to go from using a computer to paper and vice versa.

5. CONCLUSIONS

The students utilizing the e-learning platform OMB+ underperformed severely compared to the classroom learners, as was mentioned in the preceding section. We contend that the students' motivation has a significant impact on this result. We know that greater part of the understudies in the e-learning bunch favored the regular homeroom learning style in our setting in view of the review reactions. The high degree of distraction throughout the course, according to the free text replies, is one of the causes of this. The kids' lack of drive has been made worse by other factors. Initially, the pupils were not permitted to choose their own speed of learning. The students had to complete assigned tasks on specified themes within a certain amount of time since the OMB+ platform only partially replaced the preparatory course. As a result, during the trial, the benefit of

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self-paced learning was absent. In addition, the pupils had no say in the timing or place of the activity. According to what students said in the survey's free-text section, they preferred not to use the OMB+ in the designated room and instead preferred to use it somewhere else. As we discussed in Section 2, several writers assert that the main advantages for learners utilizing an e-learning platform are time and geographical freedom as well as a self-paced learning process. Due to the absence of these e-learning benefits throughout our research, there were less overall e-learning benefits, which may have led to the students' lower motivation and worse performance. Hence, we draw the conclusion that a key component of e-learning utilization is the ability to study at one's own speed and at a time and place of one's choosing. This exploration was the first of numerous at RWTH Aachen College that contrasted conventional homeroom settings and e-learning strategies and assessed the adequacy of e-learning in advanced education. Our findings show that in this scenario, the classroom learners outperformed the e-learning participants in terms of performance. We fight that since the usage of the e-learning stage was compelled all through our preliminary, as we showed in the former sections, our discoveries are not generally relevant. Our examination features e-impediments. Learning's we observe that students' inspiration is altogether influenced by independent learning and the opportunity to pick general setting.

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Author's Declaration

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