Vol. 3, Issue 2, 2023 (April – June)

ISSN 2710-4532 (Online) ISSN 2710-4524 (Print) ISSN 2710-4540 (ISSN-L)

Journal of Educational Research & Social Sciences Review (JERSSR)

Enhancing Understating Using Videos: Exploring the Role of Videos in Developing Interest and Procedural Understanding of Physics Practical

1. **Dr. Nasrin Akhter** (Corresponding Author)
Associate Professor, Department of Science Education, University of Okara, Renalakhurd
2. **Toqeer Hussain** BS Science Education, Department of Science Education, University of Okara, Renalakhurd

Abstract

This study explores the use of video in the physics Laboratory as a vital approach for boosting scientific comprehension. Given the importance of video, this study investigates the perspectives of Exploring the Role and Importance of Using Videos in Enhancing the Procedural Understanding of Physics Practical. Interviews and focus groups were used to explore the video's role and importance in improving procedural understanding of physics practicals. The 10 physics teachers were interviewed and 5 focus groups were conducted. The findings indicate that many positive traits of videos and their advantages for students were obvious although very few students and a significant minority do not share common views in most cases. Student's and teachers' responses indicate that videos enhance their interest and were easy to understand was a strong positive response to videos in laboratories, which were considered to enhance procedural understanding easy for students. The teacher's response tells that they can use videos when laboratory sessions were not possible or expensive material. The study recommends that practice should be handy and interesting with the use of videos.

Keywords: Procedural Understanding, Videos, Physics Laboratory, Technology, Experiment.

Introduction

The laboratory experience has played a central role in science education. It is said that there are many merits when students are involved in laboratory activities. Over the years, however, some educators have questioned the effectiveness and role of laboratory activity, and in response to such concerns, the history and research of laboratory work as a teaching tool have been explored. Suggested making them more engaging, challenging, and active. Therefore, it is important to maximize explores alternative approaches to maximize the learning potential of hands-on work. (Barber et al. (2008)

Simulations give students direct control by allowing them to change variables and visualize the effects of those changes (Nedungadi, Raman, and McGregor (2013). Both traditional laboratory activities and simulations are forms of investigation that involve learners in the process of forming observations, hypotheses, experiments, and inferences, but some authors prefer computer-simulated experiments as an investigative tool superior to traditional laboratories (Enyedy and Goldberg (2004).

Objectives of the study

The study has the following objectives:

1. To explore the teachers, perception of the role of videos in using laboratory
2. To explore what skills can be developed in the students by the use of videos in the physics laboratory.
3. To seek what skills can developed in the students by the use of apparatus in the physics laboratory.
4. To explore the limitations regarding videos rather practical in the Physics laboratory.

Research Questions of the Study

The study is guided by the following research questions

1. How do the teachers perceive the role of ideas in using the laboratory?
2. what skills can be developed in the students by the use of videos in the physics laboratory?

3. What skills can be developed in the students by the use of apparatus in the physics laboratory?
4. What are the limitations of using video in a physics laboratory?

Significance of Study

This study is important because it provides a comprehensive assessment of the laboratory work on online instruction in an era of education. This study highlights the importance of teachers doing laboratory work for educational growth. Examine teachers' perspectives on video work and the use of recorded lectures in Laboratory teaching. Additionally, this improves the system and provides educators with resources to develop teaching skills. The main contribution of this study is unique and noteworthy in that it provides teachers with comprehensive knowledge about how commenting on recorded lectures can help improve online teaching. Moreover, the findings will no doubt help teachers to further while boosting their confidence and knowledge about teaching in Pakistan. Therefore, the results of this study may contribute to the popularization of video in education. Additionally, this study may serve as a model for new teachers who wish to improve their teaching skills in digital and online classrooms. Teachers can recall their strengths and weaknesses during the learning process after reviewing the recorded lectures. Teachers use Laboratory work videos in their classes with applications and obstacles to enhance their online teaching. In the age of e-learning, this research and its practical implications aim to help educators improve their professional skills educators.

Review of the Related Literature

The literature review shows that to express the behind-scenes experimental Physics preparation and execution, procedural understanding is frequently implicit. The "thinking behind the doing" or decision-making that occurs when carrying out experimental tasks is known as Procedural Understanding. Understanding a group of ideas or concepts that are connected to the "knowing how" of science and required to apply science is known as procedural understanding (Rajesh B Khaparde, 2010). The foundation of procedural understanding is the conviction that comprehension of scientific evidence is founded on a body of knowledge (Gertner, Conati, & VanLehn, 1998). Hence the decision-making that happens when carrying out test errands is known as Procedural Understanding.

It is helpful to rephrase the Framework's rules as a series of student-centered questions before using it in a classroom context (Hasenbank, 2006). While guiding students' thinking, these guidelines also allowed for individual thought, design, and planning of practical operations (Rajesh B. Khaparde, 2015). It is detailed within the writing that the "open" procedural enlightening given to the understudies made a difference in them getting off to a great beginning and provoked them to consider numerous aspects of experimentation.

According to some scholars, procedural knowledge is the ability to follow steps one at a time to solve Physics numerically or accomplish a physics goal. Argued against instructors who might think procedural knowledge is unrelated and that procedures are frequently coupled to or embedded inside other processes (Hurrell, 2021). Noted that the notions concerning evidence have been separated from more conventional substantive ideas by the phrase procedural understanding. Understanding ideas like measurement and calibration, data collecting, measurement uncertainty, the capacity to assess evidence, and similar concepts are required (Roberts, *et.al* 2010). This could incorporate recognition with and knowledge of the images utilized to form calculations. Still, it can moreover apply to understanding the procedural standards required to illuminate issues.

According to this viewpoint, the procedural part of a curriculum is made up of concepts that, like the more conventional substantive aspects, create a knowledge foundation of evidence that can be taught and comprehended. For analytical reasons, the lengthy array of evidence ideas is cumbersome, thus we have divided them into subsets. Ideas about the reliability and validity of a single datum, a dataset, and connections are employed as subsets in this study (Gott, *et.al;* 2003). Students have the option of watching videos "on demand" they can pause, rewind, replay, etc. as necessary while watching the films at their convenience. This can be especially useful when students get ready to write their pre-Laboratory reports (Cicciarelli, 2013). When contradicted to the earlier strategy of private preparation, utilizing pre-recorded video demos has a few preferences. Less time went through in the course – Understudies can presently take off the room once they have completed the week's distributed test.

Videos are used as a data source for quantitative analysis, to catch phenomena that happen too quickly to perceive in real life, to capture phenomena that happen too slowly, and in combination with software. Some applications combine the recording of quick occurrences with the use of software to comprehend physics (Kettle, 2020). Stated that the educational world is becoming more interested in student learning through instructional films, whether they are used as additional material or as the main method of providing course information (Cihak, Fahrenkrog, Ayres, & Smith, 2010). On the other hand, research in two calculus classes revealed a negative correlation between students' final grades and their propensity to both attend in-class lectures and access online recordings of earlier lectures (Bergviken et.al; 2018). Similarly, the findings of this study demonstrated that using video-based reflection improved the degree of items and reflection in high school pupils (Koraneekij, 2016). They found that a video-based reflection demonstrates essentially moved forward a student's teacher's reflection.

Technology often offers access to more resources and possibilities for more learning time in research with the biggest observed impacts (Kettle, 2020). The State Schools Chief Executive Council has defined reflective practices in the context of teaching as a teacher (Hawkins *et.al;* 2016). From this perspective, popular video-sharing websites can benefit the learning process. Because students are used to them and learning doesn't seem to be primarily focused in formal classrooms. They provide real language instances and can be fully utilized under the teacher's control (Oddon, 2011). The advantage of using videos in learning contexts also results from a recent survey which suggests that students like learning languages through audio-visual material (Sherman, 2003). Hence, they include that, since of their highlights, a few sorts of recordings are especially valuable for ventures or the ponder of other subjects.

Research Methodology

This study recognizes that such effects can be a primary focus. However, it has been pointed out that the frequency of qualitative studies published in Pakistan is relatively lower than that of quantitative studies in this particular issue. Therefore, this study contributes to the evaluation research and the role of video in improving the understanding of laboratory physics practice procedures, especially using qualitative approaches such as semi-structured interviews, and focus groups its importance. Interviews and focus for this study were conducted with 10 physics teachers.

This section relates to the structure of interviews and focus groups to explore the role and importance of using video in enhancing the procedural understanding of physics practicals in the laboratory. The interviews and focus groups included three items covering various aspects of the study. Interview and focus group questions were designed to explore the role and importance of using video in improving procedural understanding of the physics practical in the laboratory. To this end, a pilot study is carried out as an important part of my research work. Participants responded positively and the results were encouraging. Participants' responses and feedback to interviews and focus group questions provided valuable information. All participants were satisfied with the content of the interview questions. In November 2022, interviews were conducted with the target sample. To ensure that the interview questions are suitable for a particular purpose. That is, to examine the role and importance of using videos to understand the steps of laboratory physics practices.

Sample and Location

Data collection is conducted personally by researchers throughout the university. The participants are asked to complete an informed consent form to indicate their willingness. Ultimately, the data collection process was completed in six weeks.

Ethical Consideration

I made contact with the participants and informed them about my research. we both agreed on the time. I met the participants according to the time given to them. They sign the consent form. the Participants agreed to give me data. I assured the participants that their information would be kept private from everyone else. I recorded his voice with the participant’s permission.

Data Analysis

This Section presents findings related to the Role and Importance of using Videos in enhancing the Procedural Understanding of physics in the Laboratory. This chapter contains all the themes exacted from this phenomenological study. The first session deals with the role of video as Audio-video (A.V) aids in the physics laboratory. The second session dealt with the importance of video during physics. The third session deals with the video and learning the procedure of understanding. The fourth session

deals with the advantages of videos in physics laboratories experiment. The last session deals with the limitations of using videos in the physics laboratory. This study took the data from the semi-structured interview data from 10 Teachers and 5 focus groups.

The following themes were emerged from the data

Theme 1: Role of video as Audio Video Aids in the physics Laboratory

Participants were inquired about their role in the video as A.V. aids in the physics Laboratory. They were asked and probed to tell about using video in their laboratory session. Collected data showed that most of the participants have three years of Laboratory experience. They started using practical videos in the laboratory in the last three years. For Example, a participant stated:

Yes, we use videos in our laboratory sessions and it is very helpful for us (T5)

On the other hand, few participants had two years of teaching experience.

Yes, we use people. To use apparel how to use a new machine. (T2)

The data showed that half of the participants favoured the use of video during Covid-19. Most of the participants think that it is not an easy task to handle software for using videos.

For Example, one participant stated:

Yes, a lot of videos were used during this time because the situation had become such that we had to go to video, in which the student also gained a lot of knowledge and the student, as well as the teacher, learned a lot (T3).

The data indicate that, Yes, a part of recordings is utilized amid this time since the circumstance had ended up such that we had to go to video, in which the understudy moreover picked up a parcel of information and the understudy, as well as the educator, learned apart.

During covid-19 our study went online, we did most of the study through audio and also through video, so what we did through video is very beneficial, and we learned a lot from it (G3S1)

This data Showed that, we have utilized Covid-19 accurately, but we did not completely get the video since the code is as well distant absent for us to elude. As a result, we utilized motion pictures for movies that were very supportive of us. The collected data showed that all the participants used the different applications and other plate forms for using their making videos of practicals.

For example, a few participants noted that:

If you do thing so that our laboratory works, there is some content we have done if we are really for us, and some videos we have to save for our records, which can also see our students can also see their colleagues (T1).

The research facility works, there are a few substances we have done on the off chance that we are truly for us, and some videos we got to spare for our records, which can too see our understudies can moreover see their colleagues. Few Participants stated that:

Because I think we make our video first and then show the video to others so time is listed so much better to show the video from YouTube or any other platform. Go and show the video (G3S2)

Yes, if you have recorded our videos and it is also beneficial for students who are not in universities to show them and it is a great experience to show your video with us to make your video and later to the Show. (G5S1)

This Data showed that the students have recorded our recordings and it is additionally advantageous for understudies who are not in college to show them and it could be an awesome encounter to appear your video with us to form your video and afterward to them Appear.

Theme 2: Importance of video during physics practicals.

Participants were inquired about the importance of video during physics practical. They were asked and probed to tell about their viewpoint and thoughts on the importance of video during physics practicals. They were asked about the importance of video during physics practicals in Pakistani universities. The data showed that most of the participants knew about the term physics practical. They believed it is a process of looking back on past experiences to analyse, examine and generate new meaning. For Example, one participant Asked:

It is very useful for us to use videos that it is very easy to use and if it is not easy to use children do badly use them, they can also be able to use them through the video and they can also see them and learn how to run them. (T1)

The data showed that it is exceptionally valuable for us to utilize recordings that it is exceptionally simple to utilize and in case it isn't simple to utilize children, on the off chance that they do severely utilize them, they can too be able to utilize them through the video and they can too see them and learn how to run them.

Other participants stated that:

> *when we are conducting the practical, then we record our video, then we show the same video to the new students and make them think a little bit about it. That is how you have to do this practice, that's why you get it together easily. (G5S3)*

This data indicates that when we are conducting the viable, at that point we record our video, and at that point, we appear the same to the unused understudies and make them think a tiny bit almost it. That's how you have got to do this viable, that's why you get it together effortlessly. Collected data showed that most of the participants feel difficult to travel on a bus or other wheels, they travel difficult. Or a low budget.

> *Sometimes it happens that some experiments are not present in our laboratory, sometimes we go to a big university, and we go and do our videos, then we show this video to our students and also show their colleagues. (T1)*

Now and then it happens that there are a few tests that are not shown in our research facility, in some cases we go to a huge college, and we go and do our recordings, and at that point, we appear this video to our understudies conjointly appear their colleagues.

Theme 3: The video and learning the procedure of understanding

Participants were inquired about the video and learned the procedure of understanding. They were asked and probed to tell about their viewpoint and thoughts on the importance of procedural understanding. They were asked about the importance of video and learning in Pakistani universities.

The data showed that most of the participants feel easy to watch the video and point out the main idea of the practical.

For Example, one participant noted that:

> *When children do practicals, their concept is our main point, it must be very clear, and they must understand what it says and what it doesn't say, how to do it, and how not to do it. The industry must have the expertise to do this well (T4)*

This thing when children do Practicals, their concept is our fundamental point, it must be exceptionally clear, and they must get what it says and what it doesn't say, how to do it, and how not to do it. The industry must have the mastery to do this well.

Another participant stated that:

> *If you want to watch a video on a topic, you will get enough videos on it, which will benefit you, and increase your knowledge, but it can also cause harm to you, but if It is beneficial for students if the balance of videos is maintained (T5)*

This thing happened in case you need to observe a video on a point, you may get enough videos on it, which can advantage you, and increment your information, but it can too cause hurt to you, but if It is advantageous for understudies if the adjustment of recordings is kept up.

This data showed that most of the participants easily grow up our knowledge and another experimentally. For Example, one, participant noted that:

> *Watching videos improves the learning skills of the students. Videos cover a lot of things in depth (G4S3)*

The data showed that the observing recordings progresses the learning aptitudes of the understudies. Recordings cover a parcel of things in profundity.

> *If you want understand by watching videos, but we do not understand much, so we have to watch videos repeatedly, so it is better to go to the practical laboratory. (G4S5)*

This data indicates that the we get it by observing recordings, but we don't get it much, so we have to observe recordings once more and once more, so it is way better that we go to the common sense research facility.

> *When the teacher is teaching in the class, some students are not picking things up properly, so videos are very important for that, so they can also learn a lot by watching the video to increase their knowledge. (G5S3)*

This thing happened When the instructor is instructing within the lesson, there are a few understudies who are not picking things up appropriately, so recordings are exceptionally vital for

that, so they can learn a part by watching the video to extend their information. Other Participants Stated that:

> *The use of videos is very beneficial as we can watch them again and again and make our experience successful (G1S5)*

Moreover,

> *When students conduct practicals, we want them to understand our key message, which needs to be very clear and includes both what it says and what it doesn't say as well as both how to do it and how not to do it. (T8)*

This thing happened when understudies conduct practicals, we need them to get our key message, which must be exceptionally clear and incorporates both what it says and what it doesn't say as well as both how to do it and how not to do it. The division must have the information to execute this effectively.

Theme 4: Advantages of videos and Practical work in physics laboratory experiments.

Participants were inquired about the advantages of videos in the physics laboratory. They were asked and probed to tell about the benefits of the physics laboratory Experiment.

Collected data showed that most of the participants easily grow up our knowledge and other experiments. For Example, one participant noted that:

> *If any apparatus is, we make it a video if it is to use, then show a child if they can use it. (T1)*

This thing happened if any device is, we make it a video of the event that it is to utilize, and at that point appear a child on the off chance that they can utilize it.

Other participants stated that:

> *When we develop a student, he should know the basic concept of what it will be used for, what is the name of the equipment and what is not the name, so there are many advantages of keeping it in the laboratory. All the students have the skills they need. (G5S1)*

The data showed that when we create an understudy, he ought to know the fundamental concept of what it'll be utilized for, what is the title of the gear and what isn't the title, so there are numerous focal points of keeping it within the research facility. All the understudies have the abilities they require.

Participants were inquired about skills that can be developed in the students by the use of apparatus in the physics laboratory.

They were asked and probed to tell about the benefits of the physics laboratory Experiment.

> *Students who do Practicals in the laboratory are very useful in the laboratory. If you have done a practical in a laboratory and you have understood it properly, then you will do it in another place, then you are good. You will be able to do it yourself and teach others, you will be able to satisfy others, and you will also learn practical things in a good way. (T3)*

Understudies who do practicals within the laboratory are exceptionally valuable within the research facility. You may be able to do it yourself and instruct others, you'll be able to fulfill others, and you'll moreover learn common-sense things in a great way.

Theme 5: limitations of using videos in the physics laboratory.

Participants were inquired about the limitations of using videos in the physics laboratory. They were asked and probed to talk about the limitations of the video to watch the video in the physics laboratory.

> *There are still some universities that are not able to build their laboratories, so they have the equipment to show videos, they are very expensive, so some universities do not have the equipment. He can watch the videos properly but he cannot perform properly. (T3)*

There are still a few colleges that are not able to construct their claim research facilities, so they have the hardware to appear recordings, they are exceptionally costly, so a few colleges don't have the gear. He can observe the recordings appropriately but he cannot perform appropriately.

> *The equipment to show movies is highly expensive, so some institutions do not have it because some universities are still unable to construct their laboratories. If the*

thought occurs, it is doable and he cannot move to another location to complete it. Although he can properly observe the videos, he cannot effectively perform. (T8)

The hardware to appear in motion pictures is profoundly costly, so a few teachers don't have it since a few colleges are still incapable to develop their possess research facilities. In case the thought happens, it is doable and he cannot move to another area to total it. Even though he can appropriately watch the recordings, he cannot viably perform.

Discussions

This finding revealed that students feel they value video in the classroom. The syllabus they had to teach is based on the content covered, but the exams set for students rewarded the correct rendering of that content. I worked with students who grew up finding rewards in memory. The educational system tended to reflect this approach. The behind-scenes experimental physics preparation and execution, procedural understanding is frequently implicit. The "thinking behind the doing" or decision-making that occurs when carrying out experimental tasks is known as procedural understanding (Rajesh B Khaparde (2010). The use of video-based reflexes for middle school students is unconventional. However, practice is increasing in higher education, especially in teacher education (Limueco and Prudente (2020). This study set out to learn more about how teachers saw the function and significance of video use in the physics laboratory. The initial part of the study question focused on how instructors felt about using video in a physics laboratory.

According to survey results and interview data, teachers place high importance on the use of video in physics experiments. Teachers believe that if they are trained in using videos, they will be better able to use them in physics laboratories. This is similar to the results that students expressed interest in using videos in the physics laboratory and were confident in using them. This finding is similar to those (Cradler, *et.al*; 2002)). When an experiment is not available in our laboratory, we occasionally travel to a large institution, film the experiment, and then display the footage to our students and their peers. They observed and learned by watching PowerPoint slideshows and videos on the projector screen, these students regarded their lessons to be helpful. Technology plays a role in determining how well a lesson is taught. Students are motivated and perform better when information and communication technologies (ICTs) are used in the classroom(Ali 2019)). For self-paced learning, particularly in distance education, videos are released in streaming format and then broadcast over the Web as Webcasts or podcasts. The outcome is supported by several researchers. Students' perceptions of the improvement in their interest in, contentment with, and desire for learning were positively impacted by the usage of videos. Students benefited from educational films by gaining a fresh perspective or learning material for the course. Additionally, it provided alternatives to conventional notes. The affordability of using movies and the ease with which a video clip could be transferred to any computer were other benefits. (McGrenere, *et.al*, 2002).

Additionally, there is a good chance that the usage of videos is limited. That requires giving serious consideration to the forms you employ, and the significance of offering movies that are simple to use, truthful, and instill freedom and trust. shows that it is necessary. For self-paced learning, particularly in distance education, videos are released in streaming format and then broadcast over the Web as Webcasts or podcasts. The outcome is supported by several researchers. Students' perceptions of the improvement in their interest in, contentment with, and desire for learning were positively impacted by the usage of videos. Students benefited from educational films by gaining a fresh perspective or learning material for the course. Additionally, it provided alternatives to conventional notes. The affordability of using movies and the ease with which a video clip could be transferred to any computer were other benefits. (McGrenere *et al*., 2002). The form is the most typical type of assistance requested by students throughout this investigation.

It is also suggested that utilizing video for data collection is less expensive and time-consuming than employing motion sensors since more than one thing can be tracked, and an object can be tracked in 2D. Bryan has been striving to use video for 25 years. He notes that students can only benefit from technology if their interactions with it and one another are intended to promote learning (Bryan 2010)).

Conclusions

The majority of the participants saw the use of videos in teaching and learning methods in the Physics laboratory. The science students found advantages in terms of interest in learning and understanding the process of practicals in the laboratory. However, the majority pointed to major obstacles in

moving from traditional methods to using video in a physics laboratory. Lack of resources and time are the main constraints of curriculum, but more important factors are poor facilities and resources that affect teaching and learning processes and low motivation and lack of cooperation among teachers. This means that students lack confidence.

Proof of video-based learning, the capacity to go looking at the net with abilities to assess, and the capacity to use thoughts in the practical video. Practical are redesigning and applying such as being self-reliant to become aware of strengths and weaknesses, and direct learning. The use of laptop technology might also additionally help significantly here. However, it is tough to teach using the video-based practical. If video technology is to be harnessed, in addition to in wider regions of learning, then dependable hardware and software programs should be employed. Contemporary technology is hindering development. Without these, development will much less probable to happen.

Reference:

Ali, S. (2019). Impacts of watching videos on academic performance at university level. *European Journal of Education Studies*.

Barber, L. J., Youds, J. L., Ward, J. D., McIlwraith, M. J., O'Neil, N. J., Petalcorin, M. I., . . . Auclair, M. (2008). RTEL1 maintains genomic stability by suppressing homologous recombination. *Cell, 135*(2), 261-271.

Bergviken Rensfeldt, A., Hillman, T., & Selwyn, N. (2018). Teachers 'liking'their work? Exploring the realities of teacher Facebook groups. *British Educational Research Journal, 44*(2), 230-250.

Bryan, J. (2010). Investigating the conservation of mechanical energy using video analysis: four cases. *Physics education, 45*(1), 50.

Cicciarelli, B. A. (2013). Use of pre-recorded video demonstrations in laboratory courses. *Chemical Engineering Education, 47*(2), 133-136.

Cihak, D., Fahrenkrog, C., Ayres, K. M., & Smith, C. (2010). The use of video modeling via a video iPod and a system of least prompts to improve transitional behaviors for students with autism spectrum disorders in the general education classroom. *Journal of Positive Behavior Interventions, 12*(2), 103-115.

Cradler, J., McNabb, M., Freeman, M., & Burchett, R. (2002). How does technology influence student learning? *Learning and Leading with Technology, 29*(8), 46-49.

Enyedy, N., & Goldberg, J. (2004). Inquiry in interaction: How local adaptations of curricula shape classroom communities. *Journal of Research in Science Teaching, 41*(9), 905-935.

Gertner, A. S., Conati, C., & VanLehn, K. (1998). Procedural help in Andes: Generating hints using a Bayesian network student model. *Aaai/Iaai, 1998*, 106-111.

Gott, R., Duggan, S., Roberts, R., & Hussain, A. (2003). Research into understanding scientific evidence. *Website: http://www. dur. ac. uk/rosalyn. roberts/Evidence/cofev. htm*.

Hasenbank, J. F. (2006). *The effects of a framework for procedural understanding on college algebra students' procedural skill and understanding*: Montana State University.

Hawkins, S., & Park Rogers, M. (2016). Tools for reflection: Video-based reflection within a preservice community of practice. *Journal of Science Teacher Education, 27*(4), 415-437.

Hurrell, D. P. (2021). Conceptual knowledge OR Procedural knowledge OR Conceptual knowledge AND Procedural knowledge:Why the conjunction is important for teachers. *Teacher Education 46*(2021). doi:http://dx.doi.org/10.14221/ajte.2021v46n2.4

Kettle, M. (2020). How videos are used in secondary school physics teaching. *Physics education, 55*(3), 035014.

Khaparde, R. B. (2010). *Need for initiatives to promote procedural understanding in physics among school teachers.* Paper presented at the AIP Conference Proceedings.

Khaparde, R. B. (2015). A Novel Approach to Encourage Students' Independent Thinking in the Physics Laboratory. *Science Education 1*(2015), 9.

Koraneekij, P. (2016). Development of a Model of Reflection Using Video Based on Gibbs's Cycle in Electronic Portfolio to Enhance Level of Reflective Thinking of Teacher Students. *Social Science & Humaniity 6*.

Limueco, J. M., & Prudente, M. S. (2020). *Improving Students' Reflections in Physics Class Using Video-based Journals.* Paper presented at the Proceedings of the 2020 11th International Conference on E-Education, E-Business, E-Management, and E-Learning.

McGrenere, J., Baecker, R. M., & Booth, K. S. (2002). *An evaluation of a multiple interface design solution for bloated software.* Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.

Nedungadi, P., Raman, R., & McGregor, M. (2013). *Enhanced STEM learning with Online Labs: Empirical study comparing physical labs, tablets and desktops.* Paper presented at the 2013 IEEE Frontiers in Education conference (FIE).

Oddon, C. (2011). Using Videos from YouTube and Websites in the CLIL Classroom. *18*. doi:https://doi.org/10.5755/j01.sal.0.18.417

Roberts, R., Gott, R., & Glaesser, J. (2010). Students' approaches to open-ended science investigation: The importance of substantive and procedural understanding. *Research Papers in Education, 25*(4), 377-407.

Sherman, J. (2003). *Using authentic video in the language classroom*: Cambridge University Press.