UNIVERSAL JOURNAL OF EDUCATIONAL RESEARCH
ISSN: 2960-3714 (Print) / 2960-3722 (Online)
Volume 2, Number 2, June 2023, 86-98
www.ujer.org

CONTEXTUAL EFFECTS OF VIDEO TUTORIALS ON THE ACADEMIC PERFORMANCE OF STEM STUDENTS IN GENERAL CHEMISTRY

Sherry V. Mecida[1], Krisna Rika O. Barron[1], Henry E. Lemana II*[1], Andre Eldridge O. Oberez[1], Alraiza K. Sampulna[1], Sheryn Mae M. Huesca[1], Sabrie K. Bailan[1], Mike Jones E. Sajorga[1], Tristan Kyle O. Sarceda[1], Queenie Rose T. Teniero[1], Orczy Louis Edniel W. Baculi[1]
Notre Dame College of Tacurong, City of Tacurong, Sultan Kudarat, Philippines[1]

Email: henrylemana_23@yahoo.com

Received: December 2022 Accepted: February 2023 Published: June 2023

ABSTRACT

As schools publicly modernize in response to societal changes, additional teaching and learning methods are developed, observed, and used since learners have different learning styles that make it easier for them to grasp and retain the material. During the COVID-19 pandemic, teachers require different media to keep the classroom involved while presenting the lesson materials online, one of which is video tutorials. The purpose of this study was to analyze the extent of contextual effects of video tutorials used in general chemistry, determine the relationship between video tutorial effectiveness and the respondents' academic performance, and analyze the significant difference between the four indicators of contextual effects of video tutorials and the respondents' profile. A descriptive-correlational quantitative research design was used in this study. The participants in this study were 144 Grade 12 STEM students from a private school in Sultan Kudarat, Philippines, who took their general chemistry course during the pandemic. The respondents were given a survey questionnaire created with Google Forms. The students agreed with all the assertions and rated them as effective in terms of their perceptions of general chemistry, implying that video tutorials are useful in teaching the subject. With p-values of .023, .046, and .010, respectively, the findings revealed a significant relationship between the overall mean of students' perceptions of the subject of General Chemistry, the concept and application of chemical knowledge and understanding, and their influence on students' academic performance. In terms of their perception, ideas, and application of chemical knowledge and comprehension, the results demonstrated that there is no statistically significant difference between the general mean of male and female students' responses. This basically means that by using video lectures, STEM students of all genders appreciate and understand General Chemistry as a subject.

Keywords: Students' perception, concept of chemical knowledge and understanding, application of chemical knowledge and understanding, video tutorials

Suggested citation:
Mecida, S., Barron, K. R., Lemana, H., Oberez, A. E., Sampula, A., Huesca, S. M., Bailan, S., Sajorga, M.J., Sarceda, T. K., Teniero, Q. R., & Baculi, O. L. (2023). Contextual Effects of Video Tutorials on The Academic Performance of STEM 12 Students. *Universal Journal of Educational Research, 2(2),* 86-98.

ORIGINAL ARTICLE

INTRODUCTION

As educational institutions have become more openly modernized in response to changes in society, more and more teaching and learning methods are discovered, observed, and used since 21st-century learners have distinct learning styles that make it simpler for them to comprehend and absorb the information in a lesson. In today's digital age, technology's accessibility and use have made information incredibly accessible, effectively established a global village, and improved teaching and learning in schools (Baba, 2014). Hence, in order to increase student achievement and participation in the classroom, worldwide school officials and administrators have attempted every conceivable strategy, including integrating technology into the curricula (Harris et al., 2016). While the use of technological advancements has been manifested in various ways in classrooms for several years already, the use of technology for pedagogical contexts and considerations has been more needed now than ever because of the COVID-19 pandemic that has had a significant influence on many facets of society, especially the educational system, disrupting classes all over the world and forcing educational institutions to employ various forms of online distance learning to fill the gap (Akdeniz & Alpan, 2020; Johnson et al., 2020; Rahayu et al., 2022; Stambough et al, 2020). This has been the call for educational institutions to create a resilient learning system based on evidence-based and needs-based data in order to implement responsive and proactive interventions (Dayagbil et al., 2021).

In response to this, teachers require different media in order to keep the classroom involved while presenting the lesson materials online. A video tutorial is one of the instructional tools that aid in the learning process (Escandor, 2022). Aimed at developing a cutting-edge method of instruction, a tutorial video makes the learning exercise engaging and meaningful. According to Lange and Costley (2020), video lessons can assist teachers in providing visual assistance to students in order to ensure that they are not missing anything when learning online. Hadgu et al. (2016) earlier mentioned that students who are juggling employment, school, and other commitments can benefit from recorded lectures since they offer greater flexibility. Students use lecture recordings to review course material, edit class notes, explain complex topics, and work independently. On top of that, students, particularly those who do not speak English as their primary or native language, benefit from the option to pause and replay the recordings. In the same vein, in order to enhance the information presented through multiple kinds of both auditory and visual media, as for Alraimi et al. (2015), video lectures offer a variety of capabilities for the learner and system to engage. The manner that media is being used in video lectures may be the most important factor because it allows for the majority of instructional methods and learner interaction. For Mayer (2014), the use of video tutorials affects how students perceive lectures, which in turn affects how they cognitively process the material that is presented to them. It goes without saying that the integration of the video into lessons varies as well depending on the various instructional objectives or the nature of the discipline. In some lessons, video can be utilized as a discussion tool to promote engagement and conversation between students, teachers, and video films in addition to being an educational tool to supplement lessons with various activities. Additionally, since video information can be duplicated, seen, and given frequently, it is successful as a learning medium and can be considered as having significant benefits for the learning process. Additionally, the advantages of video media can transcend time and place constraints and can enhance student learning whether they discuss, read, or practise (Rauf & Fauziah, 2021). Hence, based on studies on the use of video tutorials, learners receive real knowledge via video-based learning materials, which satisfies their curiosity and aids in comprehending the wonders of antiquity as they exert pressure on the psyche through the senses.

Although using video-based lessons in the classroom has many advantages, especially for teaching, it is not without drawbacks. It has been stated that videos used in classroom instruction may only present a portion of the truth and are therefore open to individual bias and interpretation. Moreover, the expense burden of using video as an instructional medium, particularly in institutions with limited resources, was identified as a challenge by Clark (2014) in Escandor (2022). While most developing nations may not be able to support this type of teaching without relying on outside financing due to the high cost of producing high-quality movies, video-based learning has become increasingly popular as a complement to and an

alternative to traditional classroom instruction (Alavi et al. 2017 in Escandor, 2022). Additionally, the absence of personal interaction is one of the key drawbacks of video-based learning in education. Even if lectures or meetings are streamed, participants may miss out on crucial body language and facial reactions. That might occur if someone encounters a stuttering video or a pixelated image from the presentation because of subpar hardware or an unreliable internet connection. These activities might hinder learning and waste resources like time and internet data subscriptions (Beheshti et al., 2018). Furthermore, although it is obvious that using both visual and auditory media in video lectures has its advantages, online educators must be aware of any potential problems that could arise from the use of ineffective media. Information transfer issues can arise specifically if media are presented in a way that restricts viewers' concentration, attention, interest, and engagement and overburdens working memory (Lange & Costley, 2020). In addition, as opined by Brandt et al. (2022), many students and teachers who inevitably spend a lot of time online may begin to exhibit signs of social isolation because of the absence of human interaction in their life. Numerous mental health problems, including increased stress, worry, and negative thoughts, are frequently brought on by social isolation and a lack of communication.

As mentioned above, multiple studies have shown that video tutorials can be highly effective educational tools. These video scenarios are well-liked teaching aids that can be applied to a variety of subjects, including history education, mathematics education, nurse education, and teacher education (Koc et al., 2019 in Escandor, 2022). However, there is a paucity of research on the topic of using video tutorials for teaching and learning general chemistry in a pandemic setting. It is evident that students learning chemistry were impacted by the pedagogical limits of instructors, who lacked proper training to use online technologies; and inherent limitations of video programs, which did not sufficiently substitute for practical learning in chemistry laboratories. As a result, research on the efficiency of online chemistry training and the suitability of different chemistry topics for online instruction is suggested. Research indicates that learning science discourse, covering general chemistry, is best done when participating in real-world tasks or authentic activities that closely resemble a culture's norms. In the case of science, this would entail engaging in daily routines similar to those of scientists. But since real-world tasks or authentic activities were hampered during the conduct of online classes and rather video tutorials were employed, this study was conceived focusing on the contextual effects of video tutorials on the academic performance of STEM 12 students in general chemistry.

Specifically, this study was conducted to find out the students' attitudes toward video tutorials in the General Chemistry subject and how it affects their academic performance in the subject. The result of this study is deemed to help Chemistry teachers know the positive and negative attitudes of the students toward learning Chemistry which will help them improve their strategies and methods in teaching. In the same way, it will help students be competent in the complex scientific and technological world that they are living in now and the findings of this study may serve as the basis for future researchers to further study this topic. Specifically, this study aims to answer the following questions:

1. What is the profile of the respondents in terms of sex?
2. What is the academic performance of Grade 12 students?
3. What is the level of contextual effects of video tutorials in General Chemistry on Grade 12 students':
    a) Perception towards the Chemistry Subject,
    b) Concept of Chemical Knowledge and Understanding,
    c) Application of Chemical Knowledge and Understanding?
4. Is there a significant relationship between the overall mean of students' attitudes toward video tutorials used in General Chemistry and their academic performance?
5. Do males and females differ significantly in the contextual effects of the video tutorial used in the General Chemistry subject?

METHODOLOGY

Research Design

The study utilized the descriptive correlational quantitative research design to determine the extent of the attitudes of Grade 12 STEM students towards video tutorials used in the General Chemistry subject and to determine a significant relationship between the overall mean of attitudes towards video tutorials in the General Chemistry subject and their academic performance.

Research Respondents, Sampling, and Locale

The respondents in this study were the Grade 12 STEM of one private school in Sultan Kudarat, Philippines. This study employed a simple random sampling technique, a completely random way of selecting the sample. The total population was 174, with a computed margin of error of 5%. The target sample size was 144, with a 20% standard error. Sample size was computed using the free software called Raosoft sample size calculator.

Research Instrument

The study adopted survey questionnaires: one from the study of Dolan et al. (2011) and another one from the study of Mahdi (2014). Questionnaires were checked by the experts and distributed to the respondents through the use of Google Survey Forms. It was composed of two parts, the demographic profile of the respondents and the data on the extent of the students' attitudes toward video tutorials used in the General Chemistry subject. The item reliability of the survey was determined using Cronbach alpha and was found to be $\alpha = .903$ on the students' perception towards Chemistry, $\alpha = .914$ on the concept of chemical knowledge and its understanding, and $\alpha = .902$ on the application of chemical knowledge and its understanding.

Data Gathering Procedures

The researchers wrote a formal letter to the high school principal seeking approval to conduct the study regarding the attitude of STEM 12 students towards video tutorials used in the General Chemistry subject. Upon the approval of the high school principal, the researchers prepared the survey questionnaires and distributed them to the respondents through Google Forms.

Data Analysis

Descriptive statistics were utilized in this study to summarize the essential aspects of the study's data. The study's moderating variable was the students' demographic profile in terms of sex since they changed the effect of an independent variable on a dependent variable. The highest and lowest frequencies or percentages were highlighted in the discussion to assess the data acquired to answer problems relating to the profile of the respondents in terms of sex. The highest and lowest means with their standard deviation (SD) were highlighted in the discussion to analyze the data gathered from the independent variables of this study, which include contextual effects of video tutorials used in teaching general chemistry in terms of students' perception of the subject, the concept of chemical knowledge and understanding, and the application of chemical knowledge and understanding. The following set of descriptions and interpretations was utilized: to interpret the contextual impacts of video tutorials on Chemistry in terms of perception of the subject, concept of chemical knowledge and understanding, and application of chemical knowledge and understanding:

The subsequent range of means with corresponding descriptions is used.

Range of Means	Description	Interpretation
3.26 – 4.00	Strongly Agree	Very effective
2.51 – 3.25	Agree	Effective
1.76 – 2.50	Disagree	Less Effective

1.00 – 1.75	Strongly Disagree	Not Effective

Academic Performance

Grades	**Interpretation**
90-100	Outstanding
85-89	Very Satisfactory
80-84	Satisfactory
75-79	Fairly Satisfactory
Below 74	Did not meet expectation

The academic performance of the respondents served as the dependent variable in this study. This study also utilized inferential statistics, specifically Pearson r, to find out the significant relationships between the three indicators (independent variables) of contextual effects of video tutorials used in General Chemistry and the academic performance (dependent variables) of the study.

To analyze the significant relationship between the contextual effects of video tutorials used in General Chemistry in terms of perception towards Chemistry, the concept of chemical knowledge and its understanding, and the application of chemical knowledge and its understanding and its influence on their academic performance, the quantitative interpretation of the degree of the linear relationship is shown in the following range of values:

Range of *r*	**Interpretation**
± 1.00	Perfect Positive (Negative) Relationship
± 0.91 - ± 0.99	Very High Positive (Negative) Relationship
± 0.71 - ± 0.90	High Positive (Negative) Relationship
± 0.51 - ± 0.70	Moderate Positive (Negative) Relationship
± 0.31 - ± 0.50	Weak Positive (Negative) Relationship
± 0.01 - ± 0.30	Negligible Positive (Negative) Relationship
0	No Relationship

Meanwhile, to determine the significant difference between the respondents' demographic profile and the contextual effects of video tutorials used in General Chemistry, a two-way ANOVA was used to determine whether or not there was a statistically significant difference between the moderating and dependent variables. The level of significance (p=0.05) was set at 0.05. Two-way means that there are two independent variables, and between groups indicates that different people are in each of the groups.

Ethical Consideration

Researchers collected this study's data from respondents. Researchers obtained consent from respondents before collecting data. To preserve students' dignity, protection, and privacy, this study kept respondents' identities hidden. This study's data was 100% honest.

RESULTS AND DISCUSSION

Profile of the Respondents

Table 1 presents the profile of Grade 12 STEM students. Data shows that 78 students (54.2%) are male, and 66 students (45.8%) are female. Among the 144 respondents, 127 students (88.2%) graduated from private institutions, while 17 students (11.8%) graduated from public schools.

Table 1. *Profile of the Respondents (n=144)*

Profile		Frequency	Percent
Sex	Male	78	54.2
	Female	66	45.8
Total		**144**	**100.0**

Academic Performance of Grade 12 Students

Table 2 shows the academic performance of STEM students in Grade 12. According to the data, 49 students (34.0 percent) received outstanding grades in General Chemistry 1 & 2 with an average of 90-100, 58 students (40.3 percent) received very satisfactory ratings, 28 students (19.4) received satisfactory ratings, 28 students (5.6 percent) received fairly satisfactory ratings, and one student (0.7 percent) failed to pass the subject.

Table 2. Academic Performance of Grade 12 Students (n=144)

Grades	Frequency	Percent	Interpretation
Below 74	1	.7	Did not meet expectation
75-79	8	5.6	Fairly satisfactory
80-84	28	19.4	Satisfactory
85-89	58	40.3	Very satisfactory
90-100	49	34.0	Outstanding
Total	144	100.0	

On Students' Perception Towards Chemistry

Table 2a. Students Perception towards Chemistry (n=144)

	Mean	SD	Interpretation
1. Chemistry becomes an easy subject, because of video tutorials.	2.86	.685	Effective
2. Chemistry becomes a worthwhile subject because of video tutorials.	2.95	.682	Effective
3. Chemistry is an interesting subject especially with the use of video clips.	2.95	.618	Effective
4. Chemistry is enjoyable with video clips provided.	3.03	.662	Effective
5. Chemistry is satisfying with the help of video clips.	3.00	.668	Effective
6. Chemistry is an exciting subject in an online class.	2.72	.759	Effective
7. Chemistry is a challenging subject online. That is why I like it.	2.77	.770	Effective
8. Chemistry is beneficial in school and at home.	3.10	.717	Effective
9. Chemistry is my favorite subject in junior high school.	2.56	.782	Effective
10. Chemistry is fun when performing home-based laboratory experiments.	2.96	.856	Effective
Overall Mean	**2.90**	**.509**	**Effective**

Table 2a shows the students' perceptions towards Chemistry. The data show that students agreed with all of the statements about their perceptions of the subject general chemistry, implying that using video tutorials to learn the subject is effective. *Chemistry is beneficial in school and at home* got the highest mean of 3.10 (sd= 0.717). It implies that most of the students agreed that Chemistry is useful not just in school but also at home during online classes and interpreted it as effective. To effectively teach science subjects such as Chemistry, experimentation or laboratory activities should go hand in hand with the concept being taught. It means that if there is no practice, either individually or in a group, all that has been learnt becomes inert knowledge (Shana & Abulibdeh, 2019).

Students also agreed with the statements that the subject *Chemistry is enjoyable with video clips provided (3.0347) and satisfying (3.000) and Chemistry is fun when performing home-based laboratory experiments (2.9653)* and interpreted as effective also. This result is also supported by the study of Fadzil and Saat (2013), which stated that learning science is enhanced and the understanding level is improved when students are engaged in science laboratory for practical experiments that provide numerous benefits, including the development of laboratory skills and scientific knowledge, as well as the comprehension of scientific concepts and theories (Shana & Abulibdeh, 2019). This makes laboratory activities appealing

because they enable students to learn with comprehension and engage in a process of knowledge construction by practising science.

Students also agreed that *Chemistry is my favorite subject in junior high school* but got the lowest mean of 2.5625 (sd= .78195). It can be inferred that most students found Chemistry easy, worthwhile, intriguing, pleasurable, rewarding, thrilling, difficult, helpful, fun, and their favourite subject with video lectures, even during the pandemic. During this era, when education is shifting from face-to-face to online, students must have realised the value of Chemistry, especially at home. Coming from the same perspective, the study of Díez-Pascual and Jurado-Sánchez (2022) explained that online instruction was useful for obtaining knowledge and contributed to the development of students' cognitive capabilities, such as their ability to think critically and solve problems. It also had a beneficial impact on their motivation, which can be attributed to the fact that the resources used in the class (such as videos, tutorials, and so on) enhanced the degree of student involvement.

On Concept of Chemical Knowledge and Its Understanding

Table 2b. Concept of Chemical Knowledge and Its Understanding (n=144)

	Mean	SD	Interpretation
1. It is easy to recall facts, terminologies, and relationships, because of the video clips provided.	2.86	.621	Effective
2. It is easy to understand chemical principles and concepts with the help of video clips.	2.85	.689	Effective
3. It is easy to draw on existing knowledge to show an understanding of the responsible use of Chemistry in society.	2.91	.578	Effective
4. It is easy to recall chemical information clearly and logically, because of video tutorials.	2.90	.672	Effective
5. It is easy to organize chemical information clearly and logically, because of video tutorials.	2.88	.668	Effective
6. It is easy to present chemical information clearly and logically, because of video tutorials.	2.92	.653	Effective
7. It is easy to remember the many chemical formulas that are difficult to remember with the help of video tutorials provided.	2.85	.640	Effective
8. It is easy to memorize the names and symbols of elements in the periodic table with the help of video tutorials.	2.84	.716	Effective
9. It is easy to comprehend the chemical nomenclature presented in the video clips.	3.11	.670	Effective
10. I found the problem-solving examples in class useful along with video tutorials.	3.02	.663	Effective
Overall Mean	**2.91**	**.502**	**Effective**

Table 2b shows that students agreed with all the statements about the concept of chemical knowledge and its understanding. Statement #9, *It is easy to comprehend the chemical nomenclature presented in the video clips* has the highest mean of 3.11 (sd= 0.670) followed by statement #10 *I found the problem-solving examples in class useful, along with video tutorials* with a mean of 3.02 (sd= 0.663) and interpreted them as effective. This means that video clips in Chemistry lesson assist learners understand the ideas. The literature suggests that many people find chemical education difficult and confusing. Chemistry's terminology, structures, and computations may explain this. Nevertheless, video clips make studying these concepts easier for many teachers and students (Mahdi, 2014).

On the other hand, statement #8, "*It is easy to memorize the names and symbols of elements in the periodic table with the help of video tutorials*" has the lowest mean of 2.84 (sd = 0.716). Students also agreed with this statement. Chemical nomenclature is one of the hardest topics taught in Chemistry if the students do not memorize the names, symbols, charges, cations, and anions in the periodic table, but with the help of video clips, it is much easier for them to memorize. Furthermore, e-learning expectations and dilemmas in obligatory subject education have not yet been studied. Teachers who wanted to combine real-world classroom experiences into online lessons found it challenging to shift to the virtual environment

because science subjects are centred on problems, observations, data, and experiments. If they possessed the skills, equipment, and expertise to teach online, teachers could be more productive. Secondary school students must learn more chemistry than the mathematical relationships that underpin it (de Quadros et al., 2011). Thus, encouraging students to like chemistry takes time and effort.

On Application of Chemical Knowledge and Its Understanding

Table 2c shows that students agreed on all the statements about the application of chemical knowledge and understanding with the help of video tutorials and interpreted them as effective. Data shows that statement #10, *I would watch the videos more than once to review the material and procedures needed to perform an experiment*, obtained the highest mean of 3. 06 with standard deviations of 0.63. Further, students agreed that statement #9, *Performing laboratory experiments help me understand Chemistry well with video tutorials supplement*, got second to the highest mean of 3.00 (sd = 0.63). While statement #2, *Chemistry becomes a simple subject and data is easy to present because of video tutorials*, got the lowest mean, which is 2.81 (sd= .65). This implies that video tutorials in Chemistry class assist students to understand, explain, and interpret chemical principles and concepts. Thus, students prefer home experiments as long as they are guided by video clips to learn Chemistry and apply their knowledge.

Table 2c. Application of Chemical Knowledge and Its Understanding (n=144)

	Mean	SD	Interpretation
1. Explaining and interpreting chemical principles and concepts become easy, because of video tutorials.	2.96	.70	Effective
2. Chemistry becomes a simple subject and data are easy to present, because of video tutorials.	2.81	.65	Effective
3. Understanding familiar and unfamiliar situations require less hours of studying with the help of video clips	2.91	.64	Effective
4. Applying chemical knowledge require less hours in performing home-based laboratory activities, because of video clips.	2.92	.56	Effective
5. It is simple to make connections between different topics, because of video tutorials.	2.94	.58	Effective
6. I learn Chemistry best when I watch the video tutorials provided in the lesson.	2.83	.72	Effective
7. Home-based laboratory activities help me understand the theory covered in lecture class.	2.92	.66	Effective
8. I can collect beneficial data from the laboratory experiments with the help of video clips.	2.98	.60	Effective
9. Performing laboratory experiments help me understand Chemistry well with video tutorials supplement.	3.00	.64	Effective
10. I would watch the videos more than once to review the material and procedures needed to perform an experiment	3.06	.63	Effective
Overall Mean	**2.94**	**.489**	**Effective**

Babincakova and Bernard (2020) state that experiments are crucial to chemistry education, but more research is needed to determine how hands-on chemistry labs affect students' knowledge. The COVID-19 outbreak and public blackout made online teaching difficult for educators worldwide. Chemistry and science teachers have to synchronise theoretical and practical instruction, requiring them to move experiments and lab operations online. In this regard, Prabha (2016) expressed that to help learners develop their innate curiosity, prospective science instructors must be prepared to integrate lab experiences into science instruction. This can motivate learners to learn scientific inquiry, generating, and validation methods.

Overall Mean of Contextual Effects of Video Tutorials in General Chemistry

Table 2d shows the overall mean of contextual effects of video tutorials used in General Chemistry. It also presents the mean and standard deviation in terms of three aspects: perception towards Chemistry,

concept of chemical knowledge and its understanding, and the application of chemical knowledge and its understanding.

Table 2d. Overall mean of contextual effects of video tutorials used in General Chemistry.

Contextual Effects	**Mean**	**SD**	**Interpretation**
Students Perception	2.8938	.50842	Effective
Concept of Chemical Knowledge	2.9139	.50225	Effective
Application of Chemical Knowledge	2.9306	.48722	Effective
Grand Mean	**2.9128**	**0.49930**	**Effective**

The contextual effects of video lessons employed in General Chemistry had a grand mean of 2.9128 (sd =.49930) and were assessed as effective, according to the results. This demonstrates that the video clips in the subject are useful in assisting students' knowledge and comprehension, particularly in effectively presenting and explaining the teachings. The overall means and standard deviations in three aspects were also displayed in the data. Students' perception received an overall mean of 2.8938 (sd =.50842) and was assessed as effective by students. An overall mean of 2.9139 (sd=.50225) was obtained for the concept of chemical knowledge, which was likewise assessed as effective. An overall mean of 2.9306 (sd =.48722) was found and assessed as effective when it came to the application of chemical knowledge.

On Contextual Effects of Video Tutorials Used in General Chemistry and Its Influence on Students' Academic Performance

Table 3 shows that there is a significant relationship between the overall mean of students' perceptions towards the subject General Chemistry, the concept and application of chemical knowledge and its understanding and their influence on students' academic performance with p-value = .023, .046 and .010 respectively. However, there is a negligible positive relationship between the three (3) independent variables and the dependent variable.

Table 3. Relationship between the overall means of the three (3) indicators of contextual effects towards video tutorials in General Chemistry and respondents' academic performance *(n=144).*

		Students Perception	**Concept of Chemical Knowledge**	**Application of Chemical Knowledge**	**GPA**
Students Perception	Pearson Correlation	1	.755**	.791**	.185*
	Sig. (2-tailed)		.000	.000	.021
	N	155	155	155	155
Concept of Chemical Knowledge	Pearson Correlation	.755**	1	.809**	.170*
	Sig. (2-tailed)	.000		.000	.035
	N	155	155	155	155
Application of Chemical Knowledge	Pearson Correlation	.791**	.809**	1	.213**
	Sig. (2-tailed)	.000	.000		.008
	N	155	155	155	155
GPA	Pearson Correlation	.185*	.170*	.213**	1
	Sig. (2-tailed)	.021	.035	.008	
	N	155	155	155	155

** Correlation is significant at the 0.05 level (2-tailed).

Meanwhile, there is a strong positive relationship among the three (3) independent variables of the study. This simply means that students did well in General Chemistry based on their impressions of the subject and with the help of video lectures. He (2012) observed that blackboard video tutorials helped students learn their subjects, especially urban college and

university students. Multimedia-assisted teaching helps students understand the topic and build cognitive and attitudinal skills due to the data offered (Shah & Khan, 2015).

The fourth research question is to determine which gender, male or female, differs significantly in terms of the overall contextual effects of video tutorials used in the General Chemistry subject and their influence on students' academic performance. Table 4 shows no statistically significant difference between the overall mean of students' responses, both male and female, in terms of their perception, concept, and application of chemical knowledge and its understanding, with a p-value equal to .893, .623, and .396 respectively. This simply implies that regardless of students' gender, the subject of General Chemistry was appreciated and comprehended by the STEM students with the use of video tutorials. Laboratory activities become fun and interesting as long as they are guided by the video clips that follow. This result confirms the findings of Nyutu et al.'s (2021) study, which demonstrated that female and male students were equally likely to view their instructional laboratories as intended by their instructors. However, earlier research investigations demonstrated that girls viewed their scientific teaching laboratory more positively than males (Gupta et al., 2015; Henderson et al., 2000).

Table 4. Difference between male and female students in terms of overall contextual effects of video tutorials used in General Chemistry subject and their influence on students' academic performance *(n=144)*.

		Descriptive Statistics			**ANOVA**			
	Sex	Mean	sd	N	df	F	Sig	Remarks
Students Perception	Male	2.89	.49	78	142	.018	.893	Not significant
	Female	2.90	.53	66				
	Total	2.89	.51	144				
Concept of Chemical Knowledge	Male	2.89	.49	78	142	.243	.623	Not significant
	Female	2.94	.52	66				
	Total	2.91	.50	144				
Application of Chemical Knowledge	Male	2.90	.50	78	142	.725	.396	Not significant
	Female	2.97	.47	66				
	Total	2.93	.49	144				
Academic Performance	Male	3.82	1.02	78	142	8.097	.005	*Significant
	Female	4.24	.70	66				
	Total	4.01	.91	144				

The difference was influenced by class interaction. Male and female students responded differently during the engagement due to student tension and competition. Remote learning eliminates interaction; therefore, it is likely that students will not notice gender variations in their perceptions and experiences. Since they can't talk to their classmates about their observations, experiments, and conclusions,

However, there is a significant difference between gender and academic performance in the subject of General Chemistry, with a p-value = .005. This means that male students excel more in the subject compared to female students. This result was supported by the work of Obrentz (2012) that found that university male and female chemistry grades differed significantly, more specifically, males outscored females. Moreover, the First and Second International Science Studies (FISS & SISS) and the Third International Mathematics and Science Study (TIMSS) found that male students outperformed female pupils in all science written achievement tests (Amunga et al., 2011). In chemistry, male students fare better than female students.

CONCLUSIONS

Based on the study's findings, it can be concluded that the contextual effects of video tutorials used in General Chemistry in terms of three aspects: students' perception towards chemistry; the concept of chemical knowledge and its understanding; and the application of chemical knowledge and its understanding can greatly influence student academic performance in the subject. The researchers concluded that most of the students who took General Chemistry got a very good grade on the subject with the help of video tutorials. Only a few students got good grades and one failed the class. Furthermore, the findings demonstrate that students agreed with all the claims and regarded them as effective in their perceptions of General Chemistry, implying that video tutorials are helpful in teaching the topic. With the use of video tutorials, most students perceived Chemistry as easy, worthwhile, intriguing, delightful, fulfilling, thrilling, difficult, beneficial, entertaining, and their favorite subject, even in the midst of a pandemic. All the assertions about chemical knowledge and understanding were likewise agreed upon by the students and interpreted as effective. Simply put, video snippets utilized in Chemistry class assist students in better understanding the concepts being taught. They also agreed with all of the statements regarding using video tutorials to apply chemical knowledge and comprehension, which they perceived as effective.

Furthermore, the findings also revealed a significant relationship between the overall mean of students' perceptions of the subject General Chemistry, the concept and application of chemical knowledge and understanding, and their influence on students' academic performance, with p-values of.023,.046 and.010, respectively. On the other hand, the three (3) independent variables have an insignificant positive connection with the dependent variable. Meanwhile, the study's three (3) independent variables have a strong positive association. This means that students who took General Chemistry got good grades because of their perception of the subject and because they used video lectures to make it easier to learn and understand the material. With p-values of.893,.623, and.396 respectively, the data revealed that there is no statistically significant difference between the overall mean of male and female students' responses in terms of their perception, concept, and application of chemical knowledge and understanding. This simply means that, regardless of gender, STEM students appreciated and understood the subject of General Chemistry using video lectures. As long as the laboratory exercises are led by the video segments to follow, they become enjoyable and intriguing.

RECOMMENDATIONS

This study suggests the following: School officials may upgrade scientific lab facilities, equipment, and apparatus, and fund Science teachers' internet teaching tools. Policymakers should help science teachers incorporate relevant teaching strategies to boost student learning. However, this data can identify vulnerable scientific students. Instructors can organize consultation hours and encouragement programs using survey results. Teachers should be creative while teaching practical exercises that make pupils love science, especially chemistry. Lab science teachers deserve praise. Teachers should educate and let students conduct a range of lab activities to make chemistry more interesting and engaging. Teachers must understand lab activities to help students conduct experiments.

Teachers should make a "gender-based effort" to improve female pupils' scientific performance by focusing on areas where they are weaker. Teachers construct gender-based activities to help pupils, especially girls, understand the subject and some that are just for girls. This will help women gain scientific self-confidence. This program's impact can be doubled if instructors are willing to correct gender-prejudiced beliefs that affect their attitudes, pedagogical methods, and tactics toward female students. This project depends on parents' science education and career goals, which will affect their daughters' life. Thus, instructors must inform female students' parents about science career alternatives and academic preparation.

REFERENCES

Akdeniz, H., & Bangir Alpan, G. (2020). Analysis of gifted and talented students' creative problem-solving styles. *Talent*, 10(1), 79–94.

Alraimi, K. M., Zo, H., & Ciganek, A. P. (2015). Understanding the MOOCs continuance: The role of openness and reputation. *Computers & Education*, 80, 28–38.

Amunga, J.K., Musasia, M.A., & Musera, G. (2011). Disparities in the Physics Achievement and Enrolment in Secondary Schools in Western Province: Implications for Strategy and Renewal. *Problems of Education in the 21st Century*, 31(31), 18-32.

Arcebuche, J. V. M. & Bernardino, M. N. R. (2022). "Participation" In Online Discussion Forum in Distance Education: An Autoethnographic Inquiry. *Universal Journal of Educational Research, 2(1),* 25-37. www.ujer.org/vol2no1/article124

Baba, P. A. (2014). Technology in the Classroom: a Tool or a Drag. Journal of Education and Practice, 5(27), 75-78. https://core.ac.uk/download/pdf/234636305.pdf

Babincakova, M., & Bernard, P. (2020). Online Experimentation during COVID-19 Secondary School Closures: Teaching Methods and Student Perceptions. *Journal of Chemical Education*, 97(9), 3295-3300. https://doi.org/10.1021/acs.jchemed.0c00748

Beheshti, M., Taspolat, A., Kaya, S.O., & Sapanca, F.H. (2018). Characteristics of instructional videos. *World Journal on Educational Technology: Current Issues*, 10(1), 61-69.

Brandt, L., Liu, S., Heim, C., Heinz, A. (2022). The effects of social isolation stress and discrimination on mental health. Translational Psychiatry, 12(398), 1-11. https://doi.org/10.1038/s41398-022-02178-4

Dayagbil, F.T., Palompon, D.R., Garcia, L.L., & Olvido, M.M.J. (2021) Teaching and Learning Continuity Amid and Beyond the Pandemic. *Frontiers in Education*, 6, 678692, 1-12. https://doi.org/10.3389/feduc.2021.678692

Dela Cruz, A., & Dela Cruz. M. (2022). The Influence of Mathematical Test Anxiety and Self-Efficacy on Students' Performance. Universal Journal of Educational Research. 1(2), 12-26. DOI: https://doi.org/10.5281/zenodo.6833527

De Quadros, A. L., Carvalho Da-Silva, D., Silva, F. C., Pereira de Andrade, F., Aleme, H. G., Tristão, J. C., Oliviera, S. H., Santos, L. J., & DeFreitas-Silva, G. (2011). The knowledge of chemistry in secondary education: difficulties from the teachers' viewpoint. *Educación química*, 22(3), 232-239.

Díez-Pascual, A. M., & Jurado-Sánchez, B. (2022). Remote Teaching of Chemistry Laboratory Courses during COVID-19. *Journal of chemical education*, 99(5), 1913–1922. https://doi.org/10.1021/acs.jchemed.2c00022

Dolan, D.S.L., Prodanov, V., & Taufik, T. (2011). *Student Perception of Lecture Video Use as a Means to Increase Time for in Class Problem Solving Applications.* California Polytechnic State University. https://www.researchgate.net/publication/304160671_Student_Perception_of_Lecture_Video_Use_as_a_Means_to_Increase_Time_for_in_Class_Problem_Solving_Applications

Escandor, I. (2022). The Effectiveness of Video-based Lessons as Instructional Materials in Light of the Covid-19 Pandemic. Munich, GRIN Verlag. Retrieved from https://www.grin.com/document/1248070

Fadzil, H.M., & Saat, R.M. (2013). Phenomenographic study of students' manipulative skills during transition from primary to secondary school. *Sains Humanika*, 63(2), 71-75. https://doi.org/10.11113/jt.v63.2013

Gupta, A., Koul, R., & Sharma, M. (2015). Assessing the science laboratory learning environments at the senior secondary level in an Indian school. *Educational Quest: An International Journal of Education and Applied Social Sciences*, 6(1), 1-9.

Hadgu, R.M., Huynh, S.H., & Gopalan, C. (2016). The Use of Pre-recorded Lectures on Student Performance in Physiology. *Journal of Curriculum and Teaching*, 5(1). 105-112. http://dx.doi.org/10.5430/jct.v5n1p105

Harris, J., Al-Bataineh, M., & Al-Bataineh, A. (2016) One to One Technology and its Effect on Student Academic Achievement and Motivation. *Contemporary Educational Technology*, 7(4), 368-381. https://files.eric.ed.gov/fulltext/EJ1117604.pdf

Henderson, D., Fisher, D., & Fraser, B. (2000). Interpersonal behavior, laboratory learning environments, and student outcomes in senior biology classes. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 37(1), 26-43.

Johnson, N., Veletsianos, G., & Seaman, J. (2020). US faculty and administrators' experiences and approaches in the early weeks of the COVID-19 pandemic. *Online Learning*, 24(2), 6–21.

Lange, C., & Costley, J. (2020). Improving online video lectures: learning challenges created by media. *International Journal of Educational Technology in Higher Education*, 17(16). https://doi.org/10.1186/s41239-020-00190-6

Mahdi, J. G. (2014). Student attitudes towards chemistry: An examination of choices and preferences. *American Journal of Educational Research*, 2(6), 351-356. https://doi.org/10.12691/education-2-6-3

Mayer, R. E. (2014). *Multimedia instruction*. In Handbook of research on educational communications and technology, (pp. 385–399). Springer.

Nyutu, E. N., Cobern, W. W., & Pleasants, B. A-S. (2021). Correlational study of student perceptions of their undergraduate laboratory environment with respect to gender and major. International Journal of Education in Mathematics, Science, and Technology (IJEMST), 9(1), 83-102. https://doi.org/10.46328/ijemst.1182

Obrentz, S. B. (2012). *Predictors of Science Success: The Impact of Motivation and Learning Strategies on College Chemistry Performance*. Dissertation, Georgia State University. https://doi.org/10.57709/2227906

Prabha, S. (2016). Laboratory Experiences for Prospective Science Teachers: A Meta-analytic Review of Issues and Concerns. *European Scientific Journal*, 12(34), 235-250. http://dx.doi.org/10.19044/esj.2016.v12n34p235

Rahayu, S., Rahmadani, E., Syafitri, E., Prasetyoningsih, L., Ubaidillah, M. F., Tavakoli, M. (2022). Teaching with Technology during COVID-19 Pandemic: An Interview Study with Teachers in Indonesia. *Education Research International*, Vol. 2022(1), 1-9. https://doi.org/10.1155/2022/7853310

Rauf, N., & Fauziah, U. (2021). The Use of Mathematics Learning Video During the Pandemic Covid-19 at SMA Datuk Ribandang Makassar. *Advances in Social Science, Education and Humanities Research*, 611(1), 363-367.

Shana, Z., & Abulibdeh, E. (2019). Science practical work and its impact on students' science achievement. *Journal of Technology and Science Education*, 10(2), 199-215. https://doi.org/10.3926/jotse.888

Stambough, J.B., Curtin, B.M., Gililland, J.M., et al. (2020). The past, present, and future of orthopedic education: lessons learned from the COVID-19 pandemic. *The Journal of Arthroplasty*, 35(7), 60–64.

Yecla, J. L., Reyes, C. T., Legaspi, C. O., & Relingo, A. M. (2022). Citizens' Assessment on Programs for Education of the Local Government Unit of Banga, Aklan. *Universal Journal of Educational Research*. 1(4), 183-192. Available at https://www.ujer.org/vol1no4/article214

Published by
SAINT JOSEPH COLLEGE
Maasin City, Southern Leyte
Philippines