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Undergraduate students' knowledge, attitudes, and practices towards the use of instructional videos in organic chemistry

Leonielyn G. Malicay*

College of Teacher Education, Surigao del Norte State University, Narciso St., Surigao City, Caraga, Philippines

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Abstract

The integration of instructional videos has become more rampant as the technology continues to evolve, bringing major changes to teaching and learning. Instructional videos brought a great impact on teaching and learning for they gave students and teachers as alternative way of delivering instruction and as well as learning Organic Chemistry concepts in an easy way. This study determined the knowledge, attitudes and practices of undergraduate students towards the use of instructional videos in Organic Chemistry. Further, it also ascertained in determining the significant difference on the students' knowledge, attitudes, and practices based on their age, sex, year level, campus, and program. A descriptive research design was used in the study. It is deemed appropriate in order to determine the extent of the students' knowledge, attitudes, and practices towards the use of instructional videos in Organic Chemistry based on their demographic variables. Findings of this study revealed that students are knowledgeable (Mean=3.40 ± 0.46), show positive attitudes (Mean=3.45 ± 0.55), and exhibit exemplary practices (Mean=3.32 ± 0.63) towards the use of instructional videos in Organic Chemistry with an overall qualitative description of "Agree". Furthermore, there is significant difference on the students' knowledge, attitudes and practices towards the use of instructional videos in Organic Chemistry in terms of their age, year level, campus, and program, thus, there is not enough evidence to support the null hypothesis. Based on their sex, there is significant difference on their attitudes while knowledge and practices show no significance.

***Corresponding Author:** Leonielyn G. Malicay ✉ lmalicay@ssct.edu.ph

Introduction

The changing educational landscape, particularly at the height of the COVID-19 pandemic, where the adoption of flexible learning modalities is becoming more popular, has provided a huge challenge for all teachers in terms of how to deliver instructions to students efficiently and effectively. With the rise of online learning, which has been adopted by most public colleges and universities in the Philippines, the application of educational or instructional videos has emerged, bringing major changes to teaching and learning. Teachers adjust pedagogical strategies and approaches by redesigning instructions and course content to keep up with the changing learning environment.

According to Kay (2012), videos are categorized in various ways based on how they are created, presented, and their educational objectives. These categories include instructional videos, video classes, e-lessons, screen captures, vodcasts (video podcasts), and web broadcasts. When it comes to students' familiarity with instructional videos, their exposure to cellphone cameras and platforms like Vimeo and YouTube has made them more comfortable with educational videos as a teaching tool (Drahl, 2010). Consequently, students prefer this type of learning material because of its accessibility and the ability to learn at their own pace. They can pause, rewind, and review specific parts of the video. Additionally, the use of visual enhancements, such as close-ups, arrows, callouts, and highlighting, directs viewers' attention to key elements that enhance their learning experience (Box *et al.*, 2016).

For instance, in a chemistry course, students engage in laboratory work and experiments that require them to understand instructions and procedures to achieve better results. The incorporation of video-based instructions has led to improved manipulative skills, better understanding of procedures and concepts (Nadelson *et al.*, 2014), increased preparation time, and enhanced student perceptions of laboratory readiness (Jolley *et al.*, 2016). Consequently, videos are now being produced to demonstrate specific laboratory techniques or experiments, making them cost-effective and versatile tools (Pekdag˘, 2017). Furthermore, instructional videos are accessible across various devices, including laptops, PCs, and mobile phones, making them highly user-friendly (Distasio, 2016). According to the iSpring Support Team (2015), these materials can be easily uploaded, shared via CDs and emails, providing students with opportunities for self-directed learning, which fosters engagement and enjoyment of the learning process (Stanic, 2014).

The widespread use of instructional videos in education has opened up opportunities for students to gain a deeper understanding of scientific concepts. Through observation and in-depth learning, students master real-world objects and sequences of movements presented in these videos (Zhang *et al.*, 2006). A study conducted by Nadelson *et al.* (2014) titled "Integration of Video-Based Demonstrations to Prepare Students for Organic Chemistry" found that videos positively influenced students' laboratory knowledge and performance. This was evident in students achieving significant gains in their laboratory experiences, leading to higher levels of achievement. Moreover, students who watched instructional videos before conducting experiments had a better grasp of laboratory preparation. These findings align with Mayer's (2011) research, which emphasized the importance of video context in enhancing students' understanding of expectations, processes, content, and their successful application in laboratory work.

Statement of the problem

This study determined the knowledge, attitudes and practices of undergraduate students towards the use of instructional videos in Organic Chemistry. Specifically, it sought to answer the following questions:

1. What is the demographic profile of the respondents in terms of?

1.1 Age

1.2 Sex

1.3 Year level

1.4 Campus and

1.5 Program?

2. What extent do the students use instructional videos as support to teaching and learning in terms of ?
2.1 Knowledge
2.2 Attitudes and
2.3 Practices

3. Is there a difference on the students' knowledge, attitudes, and practices towards the use of instructional videos in Organic Chemistry when grouped according to their profile variables?

Research hypothesis

At 5% margin of error, it is hypothesized that:

Ho: There is no significant difference on the students' knowledge, attitudes, and practices towards the use of instructional videos in Organic Chemistry when grouped according to their profile variables.

Conceptual and theoretical framework

This study is anchored on the Cone of Learning of Edgar Dale (1960) who stated that students can learn and retain 50% of the concepts if the can hear and see such as watching videos offline and online. Kay (2012) emphasized that videos help support both practical and conceptual teaching through formats such as video lectures, short knowledge clips, video tutorials, and "how-to" example-based video modeling. With this, the use of instructional videos has increased in recent years (Gold and Holodynski, 2017).

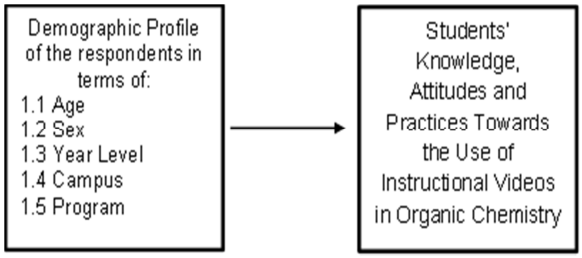

Fig. 1. Research paradigm

Shown in Fig. 1 is the research paradigm of the study. The box on the left signifies the demographic profile of the respondents such as the age, sex, year level, campus, and program which serve as the independent variables of the study. On the other hand, the box on the right shows the results on the difference of students' knowledge, attitudes, and practices towards the use of instructional videos in Organic Chemistry based on the demographic variables.

Materials and methods

This descriptive research design was used in the study. It is deemed appropriate in order to determine the extent of the students' knowledge, attitudes, and practices towards the use of instructional videos in Organic Chemistry based on their demographic variables.

Participants

Using the stratified random sampling technique, each stratum was designated based on the campus and program of the respondents who were enrolled in the 2nd Semester of the Academic Year 2021-2022 and currently taking Organic Chemistry course, were chosen as the respondents of this study.

Instrument

A researcher-made questionnaire was encoded via Google Form administered to the respondents in the data gathering process. Part 1 of the questionnaire will inquire for the respondents' profile particularly of their campus, year level, and program. Part II will ask on the students' knowledge, attitude, and practices on the use of instructional videos as support to learning Organic Chemistry topics. In this part, the following scale and qualitative description will guide the respondents in answering (Table 1).

Table 1. A scale and qualitative description for the respondents in answering.

Scale	Parameter	Qualitative description
4	3.50 – 4.00	Strongly agree
3	2.50 – 3.49	Agree
2	1.50 – 2.49	Disagree
1	1.00 – 1.49	Strongly disagree

Prior the actual data gathering, the instrument will also be validated by the panel of experts specializing in chemistry and chemistry education. After validating, a pilot test will be employed to 100 students for the determination of reliability test. Using the Cronbach's Alpha, result shows that the instrument has high internal consistency value (α=0.931) that makes it reliable and is strongly recommended for data gathering.

Ethics and data gathering procedure

A letter of request was sent to the Vice President for the Academic Affairs thru the Director of each campus in Surigao State College of Technology informing the office on the conduct of the present study. An informed consent was sent to each student via Google Form as to the duration and nature of the study, and their rights (e.g. right to withdraw) as respondents. After the preliminary procedure, the survey instrument was then administered to the 100 students of the said institution coming from different campuses and programs.

Data analysis and statistical tools

The collected data were analyzed through the use of the following statistical tools:

Frequency count percent: These tools were used to determine the occurrence of each variable on the profile of respondents.

Mean and standard deviation: These tools were used to calculate the students' knowledge, attitudes, and practices towards the use of instructional videos in organic chemistry.

One-way analysis of variance: This tool was utilized to determine the difference on the students' knowledge, attitudes, and practices towards the use of instructional videos in Organic Chemistry when grouped according to their profile variables.

Results and discussion

The gathered data uncovered the demographic profile of the respondents and the extent on the use of instructional videos based on students' Knowledge, Attitudes and Practices. This also determined their differences of their perceptions based on their demographic profile.

Table 2 presents the demographic profile of the respondents. In terms of age, it can be gleaned that majority of the respondents were 20-21 years old comprising 44.2% (F=106) of the total population and it then followed by the age 18-19 with the corresponding percentage of 32.5% (F=78). Moreover, only few of them were of the age between 22-23 (13.7%) and 24-above (9.6%) respectively. This suggests that majority of the respondents were on their 2nd year in college. On the other hand, the respondents were mostly male with a frequency of 124 (51.7%) but with close proximity to female students comprising 48.3% (F=116) of their total number. Pertaining to the campus where the students enrolled, Del Carmen campus has the highest partition in the total samples with a frequency of 75 (31.35) because it has three programs offering Organic Chemistry in this semester while City/Main, Mainit, and Malimono campuses have the same number of respondents (F=55; 22.9%) in which there were only two programs that offered Organic Chemistry course. Lastly, the programs which have the highest number of respondents were BSED Science, BS Fisheries and BS Agriculture technology with corresponding frequency of 50 (20.8%) while BS Environmental Science, BS Marine Biology, and BS Agroforestry had a smaller number of respondents (F=30; 12.5%) because the program was only offered on its respective campus.

Table 2. Demographic profile of the respondents

Profile Variables	Frequency (N=240)	Percent (%)
Age		
18-19	78	32.5
20-21	106	44.2
22-23	33	13.7
24-above	23	9.6
Sex		
Male	124	51.7
Female	116	48.3
Year Level		
First Year	110	45.8
Second Year	130	54.2
Campus		
City/Main	55	22.9
Del Carmen	75	31.3
Mainit	55	22.9
Malimono	55	22.9
Program		
BSED Science	50	20.8
BS Envi. Sci.	30	12.5
BS Fisheries	50	20.8
BS Marine Biology	30	12.5
BS Agriculture Tech.	50	20.8
BS Agroforestry	30	12.5

Depicted on Table 3 is the students' knowledge towards the use of instructional videos in Organic Chemistry. The school where the respondents are currently enrolled do not have school website or online portal which provide instructional videos for teaching and learning, having a mean of 1.67 (SD=0.47).

Table 3. Students' knowledge towards the use of instructional videos in organic chemistry

	Mean	SD	Qualitative description	Interpretation
Knowledge	3.40	0.46	Agree	Knowledgeable
1. Our college has a website/ online portal that contain instructional videos.	1.67	0.47	Disagree	Slightly knowledgeable
2. I know that I can source out instructional videos online that focus on topics in Organic Chemistry.	3.52	0.61	Strongly agree	Highly knowledgeable
3. I am well-versed on how to search instructional videos related to Organic Chemistry.	3.78	0.42	Strongly agree	Highly knowledgeable
4. I know where to search reliable instructional video sources related to Organic Chemistry.	3.79	0.41	Strongly agree	Highly knowledgeable
5. I know that Youtube contains information related to Organic Chemistry.	3.85	0.36	Strongly agree	Highly knowledgeable
6. I know that podcasts can also give me information in Organic Chemistry.	2.50	0.50	Agree	knowledgeable
7. I know that I can benchmark Organic Chemistry information on Facebook.	3.53	0.50	Strongly agree	Highly knowledgeable
8. I am sure that instructional videos can help me in my academic works (e.g. assignments, activities, online tasks, etc.)	3.85	0.35	Strongly agree	Highly knowledgeable
9. I am knowledgeable of what the speaker on the instructional video is trying to discuss.	3.63	0.68	Strongly agree	Highly knowledgeable
10. I am aware that not all instructional videos available online are reliable.	3.85	0.35	Strongly agree	Highly knowledgeable

Table 4. Students' attitudes towards the use of instructional videos in organic chemistry

	Mean	SD	Qualitative description	Interpretation
Attitudes	3.45	0.55	Agree	Positive
1. I like using instructional video in learning Organic Chemistry concepts.	3.57	0.49	Strongly agree	Highly positive
2. I prefer using instructional video than rote/conventional mode of learning.	3.60	0.49	Strongly agree	Highly positive
3. I like the instructional videos I get in Youtube.	3.80	0.40	Strongly agree	Highly positive
4. I like the instructional videos I watch in podcasts.	2.99	0.83	agree	Positive
5. I like the instructional videos posted on Facebook pages.	3.50	0.50	Strongly agree	Highly positive
6. I prefer online instructional videos than offline.	3.00	0.82	agree	Positive
7. I enjoy watching instructional video that has creative features (e.g. colors, graphics, animations, etc.).	3.47	0.50	Strongly agree	Highly positive
8. I like to watch instructional video that is direct and simple.	3.54	0.50	Strongly agree	Highly positive
9. I like instructional video that has concrete examples.	3.50	0.50	Strongly agree	Highly positive
10. I prefer brief and concise instructional video than a lengthy one.	3.51	0.50	Strongly agree	Highly positive

Though most of the students agree on the use of podcasts as one of the sources of information (Mean=2.50; SD=0.50), there were still some who are not familiar with its existence, but the use of Youtube (Mean=3.85; SD=0.36) and Facebook (Mean=3.53; SD=0.50) are the two dominant and largest sources of instructional videos, interpreted as "Highly Knowledgeable". Students are positive that instructional videos do really help them in their assignments, activities and online tasks (Mean=3.85; SD=0.35) while they are also aware that those instructional videos that they get on their sources are not all reliable (Mean=3.85; SD=0.35), thus they need careful scrutinization and validation before consumption. In general, students are knowledgeable towards the use of instructional videos in Organic Chemistry with an qualitative description of "Agree" which corresponds to the interpretation of "Knowledgeable" and a mean value of 3.40 (SD=0.46).

Table 4 presents the students' attitudes towards the use of instructional videos in Organic Chemistry. It can be inferred that they show positive attitude on the use of the videos that they get online in learning Organic Chemistry concepts (Mean=3.57; SD=0.49)

before they preferably like them than rote or conventional mode of learning (Mean=3.60; SD=0.49), both verbal interpretation of "Highly Positive" and a mean value of 3.57 (SD=0.49) and 3.60 (SD=0.49) , respectively. Moreover, students enjoy watching those videos if they are creatively and artistically made (Mean=3.47; SD=0.50), direct and simple (Mean=3.54; SD=0.50), brief and concise (Mean=3.51; SD=0.50) and with concrete examples (Mean=3.50; SD=0.50). Hence, majority of them prefer online videos rather than offline (Mean=3.00; SD=0.82). In general, students show confidence towards the use of instructional videos in Organic Chemistry with an overall qualitative description of "Agree" which corresponds to the interpretation of "Positive" and a mean value of 3.40 (SD=0.46).

Table 5. Students' practices towards the use of instructional videos in organic chemistry

	Mean	SD	Qualitative description	Interpretation
Practices	3.32	0.63	Agree	Practiced
1. Our teacher presents us instructional video as supplementary material before, during, and after the discussion.	3.40	0.68	Agree	Practiced
2. I search instructional videos online if I get difficulty understanding the discussion.	3.51	0.50	Strongly agree	Highly practiced
3. I always incorporate the use of instructional videos in studying Organic Chemistry lessons.	3.34	0.66	Agree	Practiced
4. I can easily understand Organic Chemistry topics when I watch instructional videos.	3.46	0.50	Agree	Practiced
5. I actively study online using instructional videos.	3.02	0.82	Agree	Practiced
6. I use instructional videos in answering my assignments and other activities related to Organic Chemistry.	3.53	0.50	Strongly agree	Highly practiced
7. I search multiple instructional videos to verify the correctness of the information I get.	2.97	0.82	Agree	Practiced
8. I probe if the instructional videos I get online are timely and relevant.	3.49	0.50	Agree	Practiced
9. I assess if the instructional videos I get online are accurate and reliable.	3.53	0.50	Strongly agree	Highly practiced
10. I evaluate if the sources of the instructional videos are linked to known persons or organizations in the academe.	2.96	0.83	Agree	Practiced

Presented in Table 5 is the students' practice on the use of instructional videos in Organic Chemistry. It can be deduced that students search for an information in Organic Chemistry instructional videos if they get difficulty in understanding the teacher's lecture (Mean=3.51; SD=0.50) and they use instructional videos in answering assignments and other academic works related in Organic Chemistry (Mean=3.53; SD=0.50). Both of these statements are "Highly Practiced" by the respondents. Moreover, students also assess the accuracy and reliability of the instructional videos before they used them (Mean=3.53; SD=0.50) which is also the same qualitative interpretation stated above. Further, statements number 7 and 10 tend to have lower mean score of 2.96 (SD=0.82) and 2.97 (SD=0.83), respectively, however, having an interpretation of "Positive". In general, students have outstanding practice towards the use of instructional videos in Organic Chemistry with an overall qualitative description of "Agree" which corresponds to the interpretation of "Practiced" and a mean value of 3.32 (SD=0.63).

Show in Table 6 is the significant difference on the students' knowledge, attitudes and practices towards the use of instructional videos in Organic Chemistry when they are grouped according to their profile variables. In terms of age, the three variables: knowledge (p=0.003), attitudes (p=0.025), and practices (p=0.001) show significant difference on the students' responses. In terms of sex, knowledge (p=0.065) and practices (p=0.201) do not show significant difference while students' attitudes

(p=0.022) significantly differ. For the year level, campus, and program, these variables show significant difference on the respondents' knowledge, attitudes and practices. This implies that there is not enough evidence to support the null hypothesis based on the respondents' age, year level, campus, and program while the findings in relation to the sex of the respondents, knowledge and practices tend to accept the null hypothesis, however, attitudes reject it.

Table 6. Difference of the Students' Knowledge, Attitudes and Practices Based on their Demographic Profile

Profile variables	KAP	*p*-value	Decision
Age	Knowledge	0.003	Reject H_0
	Attitudes	0.025	Reject H_0
	Practices	0.001	Reject H_0
Sex	Knowledge	0.065	Do not reject H_0
	Attitudes	0.022	Reject H_0
	Practices	0.201	Do not reject H_0
Year level	Knowledge	0.003	Reject H_0
	Attitudes	0.040	Reject H_0
	Practices	0.032	Reject H_0
Campus	Knowledge	0.000	Reject H_0
	Attitudes	0.002	Reject H_0
	Practices	0.010	Reject H_0
Program	Knowledge	0.003	Reject H_0
	Attitudes	0.039	Reject H_0
	Practices	0.027	Reject H_0

Conclusion

Based on the findings, these conclusions were drawn:

1. Most of the students are knowledgeable on how to maneuver and source out Organic Chemistry information from the instructional videos available online such as Youtube and Facebook. However, they are not yet aware on the use of podcasts.

2. Majority of the students show positive attitudes in using instructional videos in Organic Chemistry. While these can help in their academic works such as in answering their tasks and assignments, the students can also learn best when they study Organic Chemistry topics if they watch instructional videos.

3. The teachers and students exhibit exemplary practices in using instructional videos in Organic Chemistry. The teacher utilized effective strategies on integrating the use of instructional videos in the discussion to further enhance students' learning in Organic Chemistry topics while students routinarily watch pre-recorded videos to improve concept mastery.

4. There is significant difference on the students' knowledge, attitudes and practices towards the use of instructional videos in Organic Chemistry in terms of their age, year level, campus, and program, thus, there is not enough evidence to support the null hypothesis. Based on their sex, there is significant difference on their attitudes while knowledge and practices show no significance.

Recommendations

From the gathered data, below are some of the implications and suggestions for teaching.

1. The researcher may use the result of this study as a baseline data for further study such as development of instructional videos in teaching Organic Chemistry. These developed instructional videos will be used as an intervention for the conduct of experimental or quasi-experimental research in determining the conceptual understanding of the students in Organic Chemistry.

2. The researcher may also include the teacher-respondents especially those who are teaching Organic Chemistry but not Chemistry major teachers.

3. Teachers may maximize the use of pre-recorded or downloadable instructional videos in the conduct of online or face-to-face classes in teaching Organic Chemistry because these videos will supplement the lecture classes to enhance quality instruction and save teacher's time

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