

Assessment of Self –efficacy level and Challenges of Preservice Biology Teachers towards YouTube Tutorials for Learning Procedures and Skill of Improvising Models of Biological Structures

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Abstract

This study aimed at assessing the self –efficacy level and challenges of preservice biology teachers towards YouTube tutorials for learning procedures and skill for improvising models of biological structures. 196 preservice biology teachers of the Department of science education, Sokoto State University were selected to represent the population of 285. The Samples were selected using proportionate sampling technique. The study used two instruments for data collection. Biological Model Development Self-Efficacy Questionnaire (BMDSQ) and open-ended Interview schedule. Data collection lasted for three days and activities such as watching and downloading videos of YouTube tutorials demonstrating how to create some models of biological structure such as plant cell, animal cell and human digestive system. Data generated from the BMDSQ was analysed using mean to answer research questions one. The data obtained from the interview was analysed using thematic analysis. Findings of the study revealed that, preservice biology teachers are moderately confident of creating accurate and simple models of plant cell, animal cell and human digestive system, after watching YouTube videos demonstrating how to create the models. poor internet connection and high cost of data, language barrier / Ascent variation, non-availability and affordability of improvisation materials and distractions are the challenges associated with learning through YouTube tutorials.

Keywords: Self –efficacy; Preservice Teachers; YouTube; Improvising and Biological Models

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Introduction

Biology is regarded as the simplest and less abstract natural science discipline which studies the entirety of living matter. This has made it a wide subject area with many branches. The vision of every biology teacher was to guide the learner acquire knowledge of biological concepts, to enable him develop interest in the area. To achieve this, adequate and suitable instructional materials must be provided to aid the learning processes. The importance of these materials in learning biology cannot be overemphasized. Instructional materials are regarded as resources used by the teacher to help him clearly explain the topic or content to the learner so that he can understand (Tukur, 2012). These materials are basically categorized as; audio, visual and audio-visual. In biology instruction, most of the instructional materials used are visual in nature, they include real objects (specimens), Models objects, charts and photographs. Visual materials like specimens are often preferred in any biology classroom, they give the learner the opportunity to observe them in their real form, shape and study their major features. However, some biological specimens are dangerous and inappropriate to be used by the learners, hence, the rationale for developing and using their model structures to facilitate learning.

In Nigerian schools today, most of the model structures available in biology laboratories are industrial made which are too expensive and difficult to obtain by classroom teachers. Therefore, it is imperative to equip the preservice biology teachers with the skills and know-how about the production or improvisation of models for effective biology (Sayen & Mertoglu, 2020). Models according to Advance learners' dictionary refers to a copy of something or 3-dimensional representations of object or structure. Svoboda and Passmore, (2013) viewed models as representations that describe phenomena which helps in the communication of ideas. In Biology, models are used as tools in scientific inquiry, research and communication (instruction), to explain ideas or processes occurring in the natural world. The models used in biology education are either physical or computer models. Physical models can be seen and touched while computer models can only be seen and manipulated on the screen, but it cannot be touched. Concrete (physical) scale models such as a model of a skeleton are among the most commonly used in secondary school biology education (Jansen et al, 2019). Loucas et al, (2011) reported that models improved students' understanding of

concepts and their operations. Robles-Moral et al, (2023) reported that preservice teachers prefer to use physical model than digital models, probably because it was closer to a real situation and more easily understood by pupils

The teacher plays a significant role in the curriculum implementation by making informed decisions on the content to teach from the curriculum using appropriate instructional materials. Teachers are mainly categorized into two; in-service and preservice teachers. An inservice teacher is an individual who completed a teacher education programme and is already teaching in the classroom. A preservice teacher on the other hand relates to an individual who is undertaking a teacher education programme at college or bachelor degree level, learning instructional practices, content knowledge and classroom management. Ibrahim (2023) identified the difference in the preference of learning style among the preservice teachers among the needs of preservice teachers that need to be tackled by teacher training institutions in Nigeria, he opined that some preservice teachers prepare lecture using audio-video aids while others prepare normal lectures without use of teaching aids. This suggested that teachers of today must be prepared and developed to be relevant in the new classroom, by improving their knowledge, skills and competency in the use of emerging technologies for their teaching processes (Mormah and Bassey, 2021).

YouTube was founded in 2005 and becomes an important instructional tool or approach in the 21st century with a profound and significant impact on education. Existing literature shows that YouTube provides the learner with the opportunity to revise content severally, learn in any language, learn single topic from different sources or instructors. and avoid scheduled time table of classroom. The use of video-based instructional approaches such as YouTube arouses the level of Nigeria's students' interest in Biology (Edache-Abah, & Dike, 2019). Ogirima et al, (2021). Studied the Preservice teachers' perception on the use of YouTube for teaching-learning activities in Nigerian basic schools. The study used descriptive survey research design involving 200 purposively selected preservice teachers, Future Teachers' Perception towards the Use of YouTube Questionnaire (FTPUYQ) was used for data collection. Findings of the study reported a high perception for the use of YouTube in teaching-learning activities in Nigerian Basic schools among preservice teachers. In addition, the study reported that preservice teachers unanimously indicated a high level of ease of using YouTube for teaching-learning activities in Nigerian Basic Schools

The theoretical basis of these studies are Albert Bandura's theories of social cognitive learning and self-efficacy. The social cognitive learning theory hypothesized that learning occurs through observation, imitation and reinforcement. This position suggested that one can acquire knowledge and skill by observing and imitating others. The implication of this theory to this study is that preservice biology teachers can acquire basic knowledge and skills for developing models of biological structures through watching Youtube video tutorials on developing such structures. The self-efficacy theory on the other hand explains how psychological processes (learning, thinking, perception, motivation etc.) alter people's level and strength of a person's belief in his ability to perform a task or achieve a goal. Accordingly, the theory highlighted four sources through which these psychological processes influence learning, through successful performance of a task, vicarious experience, verbal persuasion and physiological state. Therefore, this theory posits that learning influences a person's belief in his ability when he or she is able to achieve success, observe others, receive feedback and encouragement from others. This implies, the self-belief of preservice biology teachers to develop models of biological structures can be altered through watching videos of other people developing such models.

Objectives of the Study

The main objective of the study was to assess the influence of YouTube tutorials on the self-efficacy level of preservice towards improvising models of biological structures. To achieve this objective, the following objectives were set for the study:

- I. To find out the self-efficacy level of preservice biology teachers to create models of plants and animal cells and human digestive system after using You Tube tutorials
- II. To find out the challenges that may hinders the use YouTube tutorials in learning procedures and skill for improvising models of biological structures among preservice biology teachers

Research Questions

Based on the aforementioned objectives, the following research questions were raised for the study:

- I. What is the self-efficacy level of preservice biology teachers in creating models of plants and animal cells and human digestive system after using YouTube tutorials?
- II. What are the challenges that may hinder the use of YouTube tutorials in learning procedures and skill for improvising models of biological structures among preservice biology teachers?

Methodology

This study adopted descriptive survey research design. The population of the study comprises 285 preservice of the Department of science education, Sokoto State University. The sample size (196) was determined using a research advisor table (2006) for estimating sample size of given population. Samples were selected using proportionate sampling technique. The study used two instruments for data collection. Biological Model Development Self-Efficacy Questionnaire (BMDSQ) and open-ended Interview schedule. The BMDSQ was designed to assess the level of self-efficacy of the respondents on developing models of biological structures. It was divided into two sections. Section A sought for demographic information of the respondents while section B consisted of 8 items seeking the level of confidence and belief of the respondents to create a model. Each item was assessed based 4 four-point Likert Scale ranging from 4 (strongly confident) to 1 (not confident). The overall score of each participant determines his/her level of self-efficacy to create the model. The Interview schedule was on the other hand designed to collect the responses of the participants on the challenges of using YouTube tutorials in teaching and learning biological concepts and processes.

The instruments were validated by specialists in Biology education, measurement and evaluation and instructional technology. Their comments and observations were noted and used to improve instruments. The reliability index of the BMDSQ was obtained following a pilot study involving 15 preservice biology teachers. Their scores were organized to calculate its reliability index using Cronbach alpha with the help of SPSS statistical software and a coefficient 0.74 was obtained

Data collection lasted for three days and activities such as watching and downloading videos of YouTube tutorials demonstrating how to create some models of biological structure such as plant cell, animal cell and human digestive system

Data collection lasted for three days and several activities were carried out during this phase. The activities of the first day involve the display of samples of industrially made models of human skeleton, digestive system, excretory system, plant cell and animal cell. Participants were allowed to carefully observe each model. Afterward, they were asked to express their confidence in developing or improvising samples of the models displayed. The activities of the second day involve playing videos of YouTube tutorials demonstrating how to create some models of biological structure such as plant cell, animal cell and human digestive system. After a specific period of watching and learning from the videos, participants were requested to download such videos and watch them again at home. The third activity which occurs on the third day, involves the administration of the BMDSQ to assess the level of self-efficacy of each participant to create models of biological structures. The last activity was the interview of the five selected participants regarding the challenges of using You Tube tutorials in teaching and learning biological concepts and processes.

The scores of BMDSQ of all the participants were recorded, organized and analysed using descriptive statistics involving simple percentage, mean and standard deviation to answer research questions one. The data obtained from the interview was analysed using thematic analysis.

Results

Research Question 1: What is the self-efficacy level of preservice biology teachers in creating models of plants and animal cells and human digestive system after using YouTube tutorials? Table 1: Result of Preservice Biology Teachers Level of Self-Efficacy

S/N	Items	Response				Mean	Decision
		NC	LC	MC	HC		
Levels of Self-Efficacy							
1	I can accurately create models of plant cell, animal cell and human digestive system	36	25	83	52	2.8	Moderately Confident
2	I can create the models that clearly identify the key components of the Structure	42	61	73	20	2.4	Low Confident
3	I can create the models that is simple and easy to understand	20	31	80	65	3.0	Moderately Confident
4	The skills acquired can contribute positively in creating biological models.	10	12	39	135	3.5	Highly Confident
5	I can comfortably handle different basic tools in developing biological	17	43	91	45	2.8	Moderately Confident

	models.							
6	I can overcome the hurdles that may arise while developing models of biological structure	12	48	84	52	2.9	Moderately Confident	
7	I can positively respond to criticism and suggestions related to the model of biological structure I created .	43	35	62	56	2.7	Moderately Confident	
8	I can be focused and composed while creating models of biological structures	32	28	74	62	2.8	Moderately Confident	

Table 1 Key: NC = Not Confident; LC = Low Confident; MC = Moderately Confident; HC = Highly Confident

Table 1 presents the analyses of the Biological Model Development Self-Efficacy Questionnaire which sought to preservice biology teachers' level of self-efficacy to create physical biological models after learning the processes through youtube video tutorials. The Table shows that the mean score of the preservice teachers respond on item one is 2.8, indicating that the participants are moderately confident they can accurately create models of plant cell, animal cell and human digestive system. The Table also shows that the mean score preservice teachers respond on item two is 2.4, this revealed that their confidence level on creating the models of biological structure (plant cell, animal cell and human digestive system) which clearly identify the key components of the structure is low. Furthermore, the analyses on the Table shows that the mean score of participants on item three is 3.0 which means that they are moderately confident in creating the biological models that are simple and easy to understand. Also, the analyses of the participants' level of confidence on item four have the mean score of 3.5 which suggested that participants in the study are highly confident the skills acquired can contribute positively in creating models of biological structures such as plant cell, animal cell and human digestive system.

The analysis of the preservice biology teachers' responses on item five shown on Table 3 revealed that the mean score of the responses is 2.8 which means that the teachers are moderately confident in handling different basic tools in developing models of biological structures comfortably. Similarly, the showed that the mean score of responses on item six is 2.9, indicating that the respondents are moderately confident they can overcome the hurdles that may arise while developing models of biological structure. The Table also showed that the mean score preservice teachers respond on item seven is 2.7, this revealed that their confidence level on positively responding to criticism and suggestion related to the model of biological structure created was moderate.

Finally, the analyses on the Table showed that the mean score of responses on item eight is 2.8, indicating that the respondents are moderately confident of remaining focused and composed while creating models of biological structures. Based on these analyses, it is clear to say that the self-efficacy level of preservice biology teachers to create models of plants and animal cells and human digestive system after using YouTube tutorials was found to be moderate in most of the items used in the assessment. However, the result showed that the participants showed low confidence in creating a detailed model of biological structure. This therefore provides an answer to research question 1.

Research Question 2: What are the challenges that may hinder the use of YouTube tutorials in learning procedures and skill for improvising models of biological structures among preservice biology teachers?

Table 2: Themes, Codes and Sample Quotes of the Respondent

S/N	Theme	Codes	Sample Quotes from Students
	Accessibility of the YouTube Tutorials	Lack of gadgets (computers, mobile phones) Poor Internet access High cost of data subscription Limited phone capabilities (keypad vs Android)	“I think i cannot use YouTube because i don't have the gadgets like computer and mobile phones” (Participant 1) “I feel it is difficult to use YouTube due to poor internet access” (Participant 2) “I believe the main challenge of using YouTube is high cost of data subscription” (Participant 3) “The type of mobile phone i am using is keypad not android” (Participant 4)
	Language and Accent related challenges	Difficulty understanding non-Nigerian accents Struggling with non-English languages (Indian, Chinese) Audio speed affecting comprehension	“The ascents used in most of videos we used are not Nigerian or African base, that is why I struggle sometime and require help and interpretation” (Participant 1) “Most of the videos I watched were either produced by Asians, Americans or Europeans. Sometimes I have to watch the clips 3 times to understand some words.” (Participant 2) “Sometimes you may see a video that interests you, when open to watch it you discover that the language of communication is neither your native nor English. It usually Indian or Chinese” (Participant 3) “The speed of the audio of some videos affect my understanding because I learn with slow and steady speakers” (Participant 4)

Availability and affordability of Improvisation Materials	Materials not available locally Materials available but not free Substitutes available and free	<p>“Most of the materials used to demonstrate the improvisation of some biological models are not available in my locality” (Participant 1)</p> <p>“I think the materials used in the videos to demonstrate models of biological structures are available in my town but not free” (Participant 2)</p> <p>“I believe the materials can be found in the town but not for cheap” (Participant 3)</p> <p>“I think those materials may not necessarily be available for free but there are substitutes available and free.” (Participant 4)</p>
Videos Distractions	Students getting distracted by frequent advertisement and videos notifications Noise and disruptions during group work Video length impacting classroom noise	<p>“I think sometime we are grouped to come closer and observed the videos while some of us are seating anxiously waiting for their turn and others discussing their task to report their observations, this makes our classroom noisy most of the time” (Participant 1)</p> <p>“the videos are short with many advertisements before and during tutorials” (Participant 2)</p> <p>“I get distracted by some other videos notifications” (Participant 3)</p>

The data presented on Table 2 showed a thematic analysis of the responses obtained from the respondents through an open ended interview. It showed the themes, codes and extracts of some responses. The themes highlighted the perceived challenges of using YouTube tutorials, they include Access to the internet, Language barrier, non-availability and affordability of materials and classroom distraction.

The first theme or challenges was Access to the YouTube tutorials. It refers to the participants’ ability to access, watch and download YouTube videos which requires some ICT gadgets and services such as Computers, Smartphones and internet subscription. Some participants reported that lack of gadgets like

mobile phones or limited capabilities of the phones are the hindrances to accessing the YouTube tutorials. Two other participants believed poor internet and high cost data are the obstacles associated with the use of YouTube tutorials while learning the procedures and skills of making or improvising models of biological structures.

The second theme identified from the result of the interview was language barrier. It was defined by the participants as the inability to comprehend the language or accent used in the audios of some YouTube tutorials due to accent variation or language barrier. A participant reported most of the audios though are in English, they neither used Nigerian nor African accent, hence he sometimes seeks for help and interpretation from someone who is more exposed to English proficiency. Another participant revealed that sometimes he may see a video that interests him but when he begins to watch it he discovers the language of its audio is either Indian or Chinese which he doesn't understand.

The third theme is the non-availability and affordability of materials. It relates to the extent of the availability and affordability of materials used in the videos to demonstrate the improvisation of models of biological structures. One participant stated that most of the materials used in demonstrating the improvisation of models of biological models biological structures are not available in his surroundings. However, another participant reported that such materials are available in his surroundings but they are neither free nor low-cost

The fourth and last theme is Classroom distractions. These themes suggested that using YouTube tutorials to acquire skills for improvisation of models of biological structures make classrooms noisy and distractive. One participant reported that while watching the videos in the classroom, they sometimes get distracted by some of their colleagues who are discussing their classwork and preparing their report and also those anxiously waiting to be invited to watch the videos. Another participant believed that long videos make the classroom noisy

Discussion

The findings of this study provided insights on the influence of YouTube tutorials on the level of self-efficacy of preservice biology teacher ability to

develop models of biological structures. It also highlighted the possible challenges associated with learning procedural knowledge and skills for creating or improvisation of models of biological structures.

The first finding of this study was made from the data obtained from the BMDSEQ which was presented on Table 1. The analysis presented revealed that most preservice biology teachers are moderately confident of creating accurate and simple models of plant cell, animal cell and human digestive system, after watching YouTube videos demonstrating how to create the models. However, most of the respondents indicated low confidence in creating the detailed models mentioned earlier with clearly identified components. This implies that using YouTube tutorials to acquire procedural knowledge and skills does not guarantee that every learner will develop a high level of confidence in creating the exact product demonstrated and produced in video tutorials he/she watched. Furthermore, the finding implies that the knowledge and skills acquired from the YouTube tutorials may not be sufficient enough to make the learner feel highly and moderately confident to develop detailed models of biological structures by showing its basic components. Regardless of this mixed outcome, it is obvious that YouTube tutorials make the learners feel confident in developing the exact product they have watched in the video. This agrees with Teng (2015) whose study revealed that learning through YouTube tutorials strengthens the level of self-efficacy of the learner

The second finding was made from the data presented on Table 2, It revealed the challenges faced by preservice biology teachers while learning through YouTube tutorials. These challenges are poor internet connection and high cost of data, language barrier / Accent variation, non-availability and affordability of improvisation materials and distractions associated with frequent advertisement and other video notifications during the lesson. This implies that no matter how much someone wants to use YouTube tutorials for learning, there are hindrances to overcome. The part of the finding which relates to poor internet access and high cost of data or subscription agree with Nurwahidah and Sitti (2023) which reported unstable internet connection among the challenges faced by University students and teachers while using YouTube videos. The study further quoted one participant saying that unstable internet connection was responsible for the poor quality of the audio of the videos causing a lot of break in and out. Thus making the learning through YouTube videos boring and difficult. The other challenge reported by the

participants which relates to distraction due to frequent advertisement and suggested videos notification was supported by Alshaikhi and Khasawneh (2025) which also revealed that YouTube advertisement, pop up notification and recommendations of other videos are among the challenges of learning through YouTube videos. These distractions usually affect the focus of the learner and makes learning difficult (Kalliebe & Shah, 2024)

Conclusion

Sequel to the findings revealed in this study, it can be concluded that YouTube tutorials improve the level of self-efficacy, but with some limitations of creating a detailed product. The study also concluded that learning through YouTube is associated with challenges such as poor internet connection and high cost of data, language barrier / Accent variation, non-availability and affordability of improvisation materials and distractions associated with frequent advertisement and other video notifications during the lesson. It is therefore, imperative

Reference

- Alshaikhi T. & Khasawneh M. A. S. (2025). Exploring digital distraction in the use of YouTube for enhancing foreign language writing proficiency. *International Journal of Advanced and Applied Sciences* 12(4) 62-70
- Edache-Abah, O. F. & Dike, J. W. (2019) Use of YouTube as an Educational Tool to Arouse the Interest of Secondary School Students in the Subject Biology in Ikwerre Local Government Area of Rivers State *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 9 (5), 17-23 DOI: 10.9790/7388-0905011723
- Ibrahim, Muhammad Alhaji. (2023). Pre-service teachers' needs: a panacea for competent schooling preparation in Nigeria. *Paedagogia Jurnal Pendidikan*, 11(1), 1-13. <https://doi.org/10.24239/pdg.Vol12.Iss1.373>
- Jansen S., Knippels M. P. J & van Joolingen, W. R. (2019) Assessing students' understanding of models of biological processes: a revised framework, *International Journal of Science Education*, 41:8, 981-994, DOI:10.1080/09500693.2019.1582821

- Kaliebe, K. & Shah, K. (2024). Digital distraction and misinformation. *Paediatric Clinic* <https://DOI.org/10.1016/j.compedu.2021.104132>
- Loucas, T. L., Muhanguzi, M., Zacharia, Z., & Costas, P. C. (2011). Objects, entities, behaviors and interactions: A typology of student-constructed computer-based models of physical phenomena. *Journal of Educational Computing Research*, 44, 173–201. doi:10.2190/EC.44.2.c
- Mormah, F. O and Bassey, A. B. (2021). Teacher education in Nigeria and the emerging technologies in the 21st century classroom. *African Educational Research Journal*. 9(3), 641-647, DOI: 10.30918/AERJ.93.19.049
- Nurwahidah and Sitti (2022). Lecturers' challenges on YouTube video as media in learning and teaching English: a descriptive research at STBA, in H. Ardi et al.(eds.), Proceedings of the International Conference on English Language and Teaching (ICOELT 2022), Advances in Social Science, Education and Humanities Research 810, <https://doi.org/10.2991/978-2-38476-166-1>
- Ogirima, O., Tolulope, J., & Temitope, S. (2021). Future Teachers' Perception towards the Use of YouTube for Teaching-Learning Activities in Nigerian Basic Schools *Mimbar Sekolah Dasar*, 8(1), 81-95. doi:<https://doi.org/10.53400/mimbar-sd.v8i1.31378>.
- Robles-Moral, F.J.;Fernández-Díaz, M.; Ayuso-Fernández, G.E. A (2023) Study of the Usefulness of Physical Models and Digital Models for Teaching Science to Prospective Primary School Teachers. *Educ. Sci.*, 13, 343. <https://doi.org/10.3390/educsci130403434>
- Sayen H. & Mertoglu H. (2020). Equipment use in biology teaching, *Journal of Educational Issues* 6 (1) 357-371 ISSN 2377-2263
- Svoboda, J., & Passmore, C. (2013). The strategies of modeling in biology education. *Science and Education*, 22, 119–142. doi:10.1007/s11191-011-9425-5
- Teng, J. (2015). *The effectiveness of video tutorial and preview on self-efficacy, task performance and learning: An experimental study conducted at a middle school in Shanghai, China* [Master's thesis,

University of Twente]. University of Twente Student Theses Repository. <https://essay.utwente.nl/69309/>

Tukur A. K. (2012). Teachers guide to improvisation and utilization of instructional materials. Ahmadu Bello University Press Limited, Zaria, Nigeria.

Zeichner, O. (2020). Enablers and Inhibitors in Teachers' Usage of Open Educational Resources. *Journal of Interactive Learning Research*, 31(3), 197-218. Retrieved April 20, 2026 from <https://www.learntechlib.org/primary/p/213807/>.