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A LITERATURE REVIEW: TEACHING FLUID MECHANICS VIA CAMPUS-BASED EDUCATION

BY

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Abstract

Science contains many concepts that can be explained in various perspectives but follow the same logic. This means that, depending on your level of knowledge, it can be taught and interpreted in several ways. In line with this, the researchers conducted a systematic review of the fluid mechanics teaching and learning process. This paper gives further understanding of the different teaching methods as well as their purposes. To do this, the researchers collected data from a reliable internet source and filtered each according to the set criteria. Since this is a systematic review, the paper followed PRISMA guidelines to ensure clarity and transparency. This gave the researchers the purpose of the different teaching methods that are meant to improve a student's performance in class.

Keywords: Systematic review, Fluid Mechanics, teaching methods

1. Introduction

The study of the behavior of liquids and gases, particularly the forces that they produce, is defined as fluid mechanics (Gentle et al., 2001). It is a branch of classical physics "with applications of great importance in hydraulic and aeronautical engineering, chemical engineering, meteorology, and zoology". It is often regarded as an empirical subject which makes use of formulae based only on observed experimental results (Mechanical Engineer's Reference Book, 12th Edition, 2013). Fluid mechanics can be a challenge to students since abstract concepts are given, such as dynamic pressure, Bernoulli's equation, and Reynolds number (Li et al., 2022). To support this, a statement from Vaidya, 2020, also shares the same thought and states that the subject is complex. To elaborate, fluid mechanics crosses disciplinary boundaries, in part because it is described by a nonlinear field theory and also because fluid phenomena are readily observed (Kundu et al., 2016).

However, despite its difficulty, the same authors also stated that the subject is important since it has unquestioned scientific and practical importance. Students in Fluid Mechanics must not only be familiar with the concepts and definitions but also provide an analytical understanding of each phenomenon. In order for students to learn fluid mechanics, they need to be taught these concepts in an efficient manner. This aims to review teaching methods that are designed to help them acquire the necessary skills in the subject. Multiple studies are presented and reviewed in this paper with the purpose of analyzing each campus-based teaching method in a logical and coherent manner.

Statement of the Problem

The main goal of this literature review is to provide an extensive review of the conducted research about the teaching of fluid mechanics via campus-based education. This study would like to specifically answer the following questions:

1. What are the different teaching methods used in learning fluid mechanics within campus-based education?
2. What are the different learning tools that are intended for the acquisition of knowledge of the students?

a) Teaching Materials
b) Teaching Activities

3. What are the purposes of the different teaching methods, materials, and activities in learning fluid mechanics?

2. Methodology

2.1 Research Design

In conducting this systematic review, the researchers utilized and followed PRISMA's guiding principles (Page et al., 2021). This is designed to help researchers report why the review was conducted, what the authors did, and what they discovered in a transparent manner. The researchers had to acquire appropriate data, articles, search strategies, and data gathering methods as part of the process.

2.2 Eligibility of Criteria

The researchers utilized a systematic design which gave the review the aspect of screening for valid literature following a specific criterion. The eligibility of literature in terms of its incorporation with the review were determined by the criteria which comprised of an inclusion criterion and an exclusion criterion. The review included gathering data related to teaching fluid mechanics via campus-based education which were garnered from published articles, journals, and other scholarly documents.

Table 1: A list of inclusion and exclusion criteria used to select relevant articles from the database

Inclusion	Exclusion
Papers about teaching strategies and learning materials Full document with results and conclusion Studies about hands-on learning	Studies from before 2010. Studies about online learning. Methodologically weak papers

2.3 Information Sources

The researchers created a compilation of literature that were able to pass the screening process of literature eligibility. By this, the researchers compiled all information pertaining to the sources of the chosen literature. There were five (5) specific literature that were incorporated with the review and its sources are the following:

Table 2. A presentation of the title and sources of studies

Literature	Origin
Enhancing Teaching and Learning of Fluid Mechanics with Interactive Computational Modelling.	Journal of Physics: Conference Series, 1286, 012047.
Fluid Mechanics with Historical Perspective, Engineering Education.	2:1, 33-39, DOI: 10.11120/ened.2007.020100 33
Student's Perceptions Regarding Assessment Changes in a Fluid Mechanics Course.	Education Sciences. 9. 152.10.3390/educsci902015 2.
Learning Styles of Engineering Students. Journal of Engineering Education Transformations.	30. 44. 10. 16920 /jeet /2016/ v30i2/10 5438.
Incorporating Simple Classroom Demo Experiments to Enhance Teaching of Fluid Mechanics.	2010 GSW, unknown. 10.18260/1-2-620-39013.

2.3. Data Gathering Procedure

The researchers administered the guidelines of a systematic review utilizing PRISMA's guiding principle upon conducting the literature review. A series of keywords were used on researching for literature titles coherent with the title of the review "Teaching Fluid Mechanics Via Campus-Based Education". An initial screening was also done which removed articles having abstracts and titles that were either lacking relevance to the purpose of the review or were duplicated in terms of the synthesis of its contents. Another screening was then performed in relation to the review's eligibility criteria pertaining to the relevance, validity, and quality of the articles. Upon accomplishing the screening processes, the researchers compiled all criteria mediated literature for analysis and interpretation

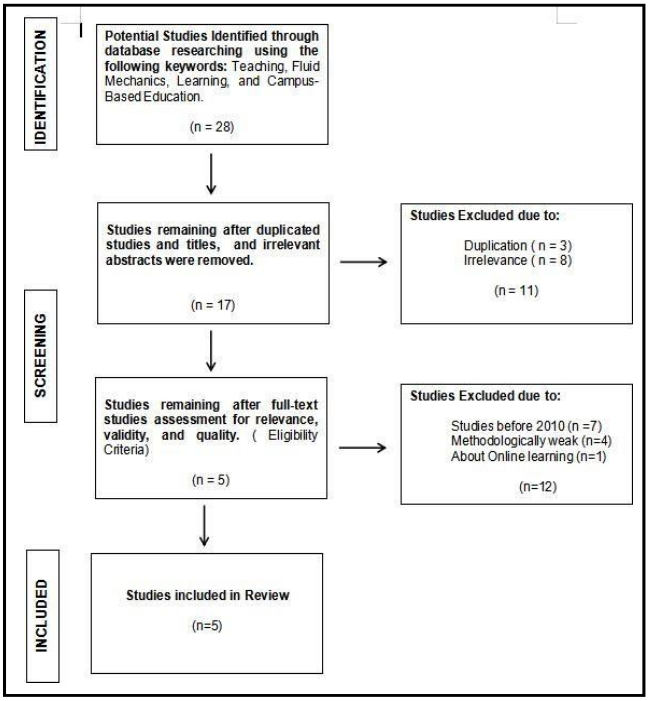

Figure 1: PRISMA table of the Literature Review: Teaching Fluid Mechanics Via Campus-Based Education

3. Results and Discussion

3.1. Study Selection

The authors of this study have identified a total of 18 studies that could provide information for this systematic review and, through screening, have only identified a total of 5 that met the criteria. A total of 23 studies have been removed since they either did not contain a result or did not focus on campus-based learning. On the other hand, the studies that were deemed as eligible met the criteria because all the studies had results and conclusions and were focused on teaching and learning fluid mechanics. The papers

included were the studies of: Albers & Bottomley (2012), Neves (2019), Esteves et al. (2019), Bayu (2020), Romero & Martinez (2014), Li et al. (2022), and Guseinova (2018).

3.2. Risk of Bias Within Studies

This systematic review has little bias since the papers selected followed the criteria set by the authors. The majority of the studies were conducted quantitatively, which means that the results pose no bias, except for the study of Romero & Martinez (2014), which was qualitative research, which included the feedback of the students.

3.3. Risk of Bias Within Studies

The data that was gathered was taken from credible sources. The authors of this systematic review made use of Google Scholar to filter results to search for scholarly articles. It is also made sure that the data gathered is related to the teaching and learning process of fluid mechanics.

3.4. Discussion

The results that were gathered utilized different teaching methods. Firstly, according to the study of Bayu (2020) about improving students' performance through remedial action, the process used active learning as a method, which can be categorized under the instructional-based approach. Another paper which had a similarity was the study of Albers & Bottomley, which stated that they had a goal of creating a new instructional method centered around activity-based learning. Activities are part of the subject's curriculum, which is why the same can be said about the paper by Neves about interactive computational modelling, wherein the teaching and learning process are conducted through activities. It is also worth stating that the research of Romero & Martinez (2014), Li et al. (2022), as well as the study of Albers & Bottomley (2012) had a practical manner of enhancing the learning process in fluid mechanics by conducting simulations, experiments, and hands-on activities.

Despite the method of teaching, the process is always accompanied by tools that are necessary. Among the results that have been gathered, the tools can be categorized into materials and activities. For the methods that were suggested in the papers by Albers & Bottomley and Li et al., they utilized experiments as an activity in order to teach concepts such as flow rates and Bernoulli's principle. In order to conduct the experiment, they would need certain objects that may or may not be needed to be improvised as materials for the experiments like the volume flow rate control and the free jet experiment. However, in the case of Neves and Romero & Martinez, since they have a simulation-based or illustrative approach, they utilized applications such as Geogebra and Modellus to teach students.

All of the data gathered points to the same conclusion: the student's performance in fluid mechanics has improved. As stated in the pedagogy of Guseinova (2018), the effectiveness of the educational process depends on the involvement of students in active learning activities as a person develops and presents himself. Esteves et al. (2019) also agree with this since a result of their research stated that the students considered their involvement in practical work motivated them to learn the subject. In conclusion, the scientific and methodological materials used in the practice of professional education ensure the development of professional competencies in the individual work of technical university students and streamline the workflow of the institutions of higher professional education, improving the quality of education.

References

1. Neves, R. G. (2019). Enhancing Teaching And Learning Of Fluid Mechanics With Interactive Computational Modelling. Journal of Physics: Conference Series, 1286, 012047.
2. Dr. Gary Lock (2007). Fluid Mechanics with Historical Perspective, Engineering Education, 2:1, 33-39, DOI: 10.11120/ened.2007.02010033
3. Sena-Esteves et al., (2019). Student's Perceptions Regarding Assessment Changes in a Fluid Mechanics Course. Education Sciences. 9. 152 10.3390/ educsci9020152.
4. Tulsi, Pk & M P, Poonia & Priya, Anu. (2016). Learning Styles of Engineering Students. Journal of Engineering Education Transformations. 30. 44.10.16920/jeet/2016/v30i2/105438.
5. Li, X., & Zhou, A. J. (2022). Incorporating Simple Classroom Demo Experiments to Enhance Teaching of Fluid Mechanics Paper presented at 2010 GSW, unknown 10.18260/1-2-620-39013.