A STUDY OF STUDENTS' LEARNING PATHWAYS ON THE BUOYANT FORCE THROUGH THE CoSci LEARNING PLATFORM

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The study of students' learning pathways is necessary for teachers to understand how students learn. In learning or solving some problems, the students have their own strategy for constructing knowledge to learn and solve. During students' learning, they will apply their previous knowledge to further create a body of knowledge. For example, students need to understand basic concepts related to the buoyant force – density, mass, volume, water level, weight, and depth – before solving the buoyancy problem (Wongsuwan & Huntula, 2019). Therefore, if teachers know how students learn, they can encourage and promote students to learn better. Teachers can also know what the difficulties for students in learning are. However, to study how students learn and learning pathways, is to study something inside a person. Yet, some students are not able to express their thoughts by speaking or writing, which makes it difficult to understand how they learn and their learning pathways. Therefore, it is a challenge for teachers to find appropriate ways and strategies to understand students' learning pathways validly. One of the reliable tools used to investigate students' conceptual understanding and students' learning pathways is the CoSci learning platform with an interactive computer simulation. The CoSci can be used to record students' behaviors such as students' answers, frequency of operating computer simulations, times, and date of interaction with the platform. Moreover, there is the Lag Sequential Analysis function (LSA) which is one of the functions of CoSci to calculate and display students' activity patterns, referred to as a learning pathway in this presentation.

This study aims to investigate 1) students' learning pathways on the buoyant force, and 2) the relation between Predict-Observe-Explain (POE) activity performance and learning performance of eighteen students in eleventh grade in science classrooms of a university-affiliated school project (SCiUS), Khon Kaen University, Thailand. The focusing conception was the buoyant force and the basics conception related to the buoyant force which are mass (M), volume(V), density(D), the level of solution(L), submerged depth(H), and weight(W). The POE with the interactive computer simulation (i.e., the CoSci learning platform) was developed on the CoSci platform based on students' alternative concepts and used to facilitate students' conceptual understanding of the buoyant force (Wongsuwan & Huntula, 2021). In this study, the LSA was used to calculate and display students' learning pathways while students were learning on the CoSci meanwhile, Spearman's correlation was used to compute the correlation between the post-test score (learning performance) and the score of each step of the POE. The findings showed that the most difficult concept for students to learn about the buoyant force was the concept related to the mass of the object. This study identified two groups of students' learning pathways patterns on the buoyant force: 1) the V-M-W pattern, which is starting from the basic concepts of volume then mass, and weight consequently which facilitated students in learning the buoyant force; 2) the W-M-V pattern, which means student started to learn the basic concepts of weight then mass and volume consequently, that made students still confused in learning the buoyant force. Spearman's correlation showed a significant positive relationship between learning performance and explanation score ($r=1.00$, $p<0.01$) and a significant negative relationship between learning performance and the frequency of running the simulation ($p<0.05$). The implications of the findings are discussed in this presentation.

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