IMPROVING THE STUDENTS’ SELF-EFFICACY BELIEFS TOWARD LEARNING SCIENCE THROUGH A FLIPPED TEACHING MODEL

Jin Su Jeong, David González-Gómez

Departamento de Didáctica de las Ciencias Experimentales y Matemáticas, Universidad de Extremadura (SPAIN)

Abstract

The learning process is not only strived on the students’ cognitive factors, but also other factors such as the students’ affective domain or self-efficacy beliefs must be considered in order to reach a significant learning. Regarding of students’ self-efficacy beliefs, different studies have already reported to be an important mediator of students’ learning behaviors and the amount of effort they attribute to learning. Self-efficacious students will be more likely to perform more challenging activities and preserver in difficult situations. Thus, this research aims to assess the influence of undertaking a flipped-classroom strategy in the students’ self-efficacy toward learning science. The study was conducted in a General Science course at the Teaching Training School of the University of Extremadura, Spain. Self-efficacy students’ beliefs were collected before starting the course (pre-test) and after the course was completed (post-test) using a previously validated questionnaire. The results obtained in this research suggest that the flipped classroom teaching methodology is an appropriate strategy to improve the students’ self-efficacy beliefs towards science not only in scientific skills but also providing more confidence in their ability to use science.

Keywords: Flipped learning, scaffolding, science education.

1 INTRODUCTION

To acquire the proper knowledge in the education, learning strategies act as an important position [1,2]. Thus, they are frequently interconnected with the learning based on self-regulation, motivation and affective domain [3,4]. Widespread proof recommends that non-traditional teaching methodologies can promote academic accomplishment and optimistic student attitudes and many studies specify the active learning effectiveness as Prince [5] have reviewed that he have carried out trustworthy chores. Those are scientific examination and other analytical intellectual activities to encourage self-regulated learning, exceptionally in a science education. The proficiencies concerned in these accomplishments involve the motivational, cognitive, metacognitive progressions of planning, reproducing, estimating and adjusting strategies on the basis of outcomes [6,7].

Flipped and active learning are outlined as any teaching method that participates the students in the process of their learning. That necessitates the students to acknowledge meaningful learning activities and contemplate about what they are tangled with more cognitive dispensation and connotation building [5,8]. A literature review of applicable teaching approaches for encouraging self-regulation in university students has discovered that these activities increase their attainment for resolving complications and enchanting in investigation and precarious thinking [7]. Also, flipped and active learning methodologies supplement the absence of practical abilities obtained by the students that have essential allusions for labor market conversion.

These activities can act to carry out the students faster to the professional and practical world that stresses the procurement of cognitive and meta-cognitive abilities [9-11]. Flipped and active methods build up possessions that permit learning throughout the practice. Accordingly, the students have to adjust their theoretical knowledge to the prearranged charge and then redirect on what the understanding means. The practice is a significant part of the learning involvement and the embellishment of approaches involve flipped and active cognitive dispensation on the learners’ part [13,14]. In this kind of teaching instruction application, the design and development of learning accomplishments takes a meaningful assessment. In a current research, numerous features that develop an inspiration on the design and development of learning activities had been labeled and measured [15].

The affective domain impact in learning procedure for students is previously deliberated in many researches [1,3,6], accomplishing the emotions act an essential part in the complete teaching-learning
procedure in principally scientific education disciplines [12]. The learning procedure is not only endeavored on the students’ cognitive features, but also other features such as the students’ affective dimension or self-efficacy beliefs should be pondered in order to grasp a substantial learning. Regarding of self-efficacy beliefs of our students, diverse lessons have already described to be an essential facilitator of students’ learning performances and the quantity of determination they attribute to education. So, self-efficacious students can be more liable to complete more thought-provoking activities and conserver in challenging circumstances.

This research targets to evaluate the influence of undertaking a flipped-classroom strategy in the students’ self-efficacy toward learning science. This work was conducted in a General Science course at the Teaching Training School of the University of Extremadura. Self-efficacy students’ beliefs were collected before starting the course (pre-test) and after the course was completed (post-test) with a previously validated and proven questionnaires. The questionnaire comprised of seven questions targeted to estimate the expansion of students’ self-efficacy in the context of flipped learning program (pre- and post-test). The students were requested to notch each question on the basis of a 0 to 10 scale level, where 0 meant powerfully disagreed and 10 powerfully agreed.

2 METHODOLOGY

The research was conducted in a General Science course at the Teaching Training School of the University of Extremadura during the second semester of 2016/17 course year. The students contributing in this research were arbitrarily organized to track an active and flipped learning methodology related to a flipped classroom environment. No restraints and restrictions were enforced, and the students spontaneously indicate whether they needed to contribute in the research.

In the flipped classroom environment, an active and flipped learning methodology improved to the learning setting was tracked. This methodology comprised of delivering students diverse situation educations for each subject division. Moreover, the professor promoted the communication and implication of students in the case study via different interactive networks that are executed in the flipped classroom course such as asynchronous debate settings.

In order to cause and involve students to dynamically contribute in these undertakings, the contribution and involvement is rated throughout the case discussion. For individually incident study, the students require to propose a statement focusing on all the enquiries and resolving the conditions states in the case studies. The proposal of all planned activities is obligatory. The course last evaluation consists of the grades attained in the diverse activities prescribed during the course along with a definitive exam. Assortment was other valuation instruments engaged to evaluate the students’ development in terms of learning matters and abilities. Each student’s portfolio embraces self-assessment consequences, on-line and in-person assessment assessments and the students’ judgement surveys. Portfolio was a multimodal device in the learning progressions.

The questionnaire comprised of seven questions targeted to estimate the expansion of students’ self-efficacy in the context of flipped learning program (pre- and post-test). The students were requested to notch each question on the basis of a 0 to 10 scale level, where 0 meant powerfully disagreed and 10 powerfully agreed.

3 RESULTS

The self-efficacy beliefs of students towards the learning methodology was measured with a closed-ended questionnaire as explained in the section of methodology. Table 1 displays the explanation of self-efficacy questions and recapitulates the 1 to 10 scale scores specified for each question by the students participated in the pre- and post-test group. The non-parametric Mann-Whitney test was employed to anticipate the significant differences of the flipped teaching methodology.
Table 1. Self-efficacy question score comparison of the students on pre- and post-test

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have been able to understand the concepts worked during the course</td>
<td>7.39 (1.86)</td>
<td>7.93 (1.49)</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>I have been able to overcome the problems arise during the course</td>
<td>5.61 (2.61)</td>
<td>7.91 (1.50)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>I have been able to estimate the emissions of a particular industrial area</td>
<td>5.23 (3.28)</td>
<td>8.39 (1.57)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>I have been able to apply all necessary resources to achieve the course learning goals</td>
<td>6.04 (2.94)</td>
<td>8.44 (1.31)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>I can get good results without much efforts</td>
<td>4.92 (1.92)</td>
<td>6.40 (2.68)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>I have been able to calculate the efficiency of the emissions control devices</td>
<td>4.73 (3.11)</td>
<td>8.57 (1.25)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>I have been able to apply the dispersion models</td>
<td>4.07 (3.07)</td>
<td>8.45 (1.39)</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

For the effects of the flipped learning methodology on the self-efficacy beliefs of students, the results attained in this work indicated that the students on post-test displayed higher self-efficacy beliefs than those from the pre-test. The alterations between both clusters were statistically noteworthy for all questions but one question (question 1) as exposed in Table 1. The higher marks for self-efficacy beliefs were described for those questions straightforwardly connected with the application of the course proposed educated skills and competences. Higher scores of self-efficacy beliefs to accomplish a scrupulous assignment have been connected with a improved presentation and more satisfaction while accomplishing a task.

Thus, lower marks in self-efficacy beliefs have been connected with a higher nervousness to collapse for the course. Hence, the succeeding an active and flipped learning methodology in a science learning context also underwrites to diminish the nervousness to fail. Moreover, many researchers designated that the interaction lack between teachers and students in flipped learning programs were one of the reasons to propagate insolation sentiment and absence of self-direction, organization and a forfeiture of enthusiasm. Altered authors designated that indorsing self-efficacy beliefs are interrelated with the advancement of the students’ motivation, implementation and capability to advance their educational and specialized attentions and purposes, and therefore this is additional positive importance of succeeding this active and flipped methodology in a science education learning context and setting.

4 CONCLUSIONS

This investigation aims to measure the influence of undertaking a flipped-classroom strategy in the students’ self-efficacy toward learning science. The study was conducted in a General Science course at the Teaching Training School of the University of Extremadura. Self-efficacy students’ beliefs were collected before starting the course (pre-test) and after the course was completed (post-test) using a previously validated questionnaire. The results gotten in this investigation suggest that the flipped classroom teaching methodology is a suitable strategy to progress the students’ self-efficacy beliefs towards science not only in scientific skills but also providing more confidence in their ability to use science.

A flipped methodology decreases the negative self-efficacy in the students could donate to increase the students’ fulfilment with the learning involvements as it was recommended in previous studies aforementioned in the section of introduction. Endorsing positive self-efficacy has a pertinent significance in a flipped and active learning program where it was stated that negative attitudes and displeasure with the education involvement were amongst the main drawbacks of the flipped and active learning program.
ACKNOWLEDGEMENTS

Authors thank to Consejería de Economía e Infraestructura y Fondo Social Europeo (Project IB18004 and Project GR18004) and Project EDU2016-77007-R (AEI/FEDER, UE) of the Ministry of Science, Innovation and Universities of Spain for their support.

REFERENCES


