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Effects of Cooperative Active Learning Experiences on Achievement, Attitudes, and Behaviours in Biology

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The abstract

In recent years, many reforms have attempted to promote new learning strategies, such as active learning, Inquiry-based learning, and Problem-based learning. One approach to active learning is cooperative learning, which has social advantages and academic benefits. The aim of this research is to determine the impact of the implementation of cooperative learning on the achievement, attitude, and behaviour of first-year biology undergraduate students. This study is taking place at the University of Limerick, and involving students from their first year of Biology teacher education programme. In order to achieve the research aims, a mixed method approach will be used. Quantitative method will be applied through cooperative learning, perception, questionnaire, and academic achievement and attitude of first-year life science students. The qualitative method will be applied through interviews; interviews will be conducted with randomly selected first-year biology students in the experimental group.

1. Introduction

Since 2000, many studies have made it clear that there is a worrying crisis in relation to students' interest in science as a potential future career. One of the elements that have contributed to low interest in science by learners is the method adopted for teaching and learning science [1]. Cooperative learning can develop various skills and it also lays a robust foundation for learning, social skills, leadership, mutual trust, making decision, and connection among students [2]. This method depends on working in a heterogeneous group in which learners work as a team to develop and broaden their skills and other team members [3].Cooperative learning is "the instructional use of small groups so that students work together to maximize their own and each other's learning"[4].

2. Overview of relevant literature

The key to a successful cooperative learning environment is the inclusion of the main elements of cooperative learning as following:

- Positive interdependence: Positive interdependence in a cooperative learning position means that the goals of one student in the group correlate with the goals of other members in the same group in order to achieve their goal [5].
- Individual accountability: Group accountability exists when each member in the group is assigned to the share of the working group so that each individual masters all articles to be learned [6].
- Face-to-face promotive interaction: Face-to-face interaction refers to the fact that group members meet face to face to work in cooperation to resolve scientific question and encourage each other's success [7].
- Interpersonal and small group skills: In cooperative activities, students participate in task work and group work altogether to mutual goals. Team members not only build trust, have precise contact, and accept and support each other, but they also solve collisions constructively [8].
- Group processing: It can be defined as the decision to be made about what action to carry on or to modify; teachers can also create opportunities for students to evaluate group improvement. Group processing authorises groups to concentrate on perfect working connections, simplifying knowledge of collaborative skills and making certain that feedback be given to students [9].

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According to Johnson and Johnson (2009) there are three different types of cooperative learning, namely informal cooperative learning, formal cooperative learning and cooperative learning base group. The formal cooperative learning groups extends from one class to several classes, students are working together effectively to realize their common goal and achieved particular tasks. However the Informal cooperative learning is a group of students who are working with each other to obtain a common learning objective in provisional and specified group for a few minute periods to one lesson. Finally, cooperative base learning groups are long-term phase, diverse group, and steady students whose goal for members is to provide each other's motivation, help and support to make academic improvement, take responsibility among groups to learn and achieve tasks[10].

3. Methods of cooperative learning

The teaching methods of cooperative learning can take many different forms, but all these methods share the same basic features such as dividing students into groups to promote cooperative learning, enhance interaction among students, and change and adjustment the way of providing the learning materials to students. The most important cooperative methods are discussed below:

- Student teams achievement divisions (STAD): Student teams' achievement divisions (STAD) provide an opportunity to learn a wide variety of subjects such as mathematics, language, geography, and science facts and concepts [11]. Students in STAD are classified in various groups according to their abilities, gender, and ethnicity. The teacher in this method presents a lesson and students' work as a group following individual quizzes. Group points are calculated based on the number of points obtained by each student in the group. The group scores are noted at the end of the class [12]. The main aim of STAD is to progress and speed learning accomplishments [13].
- Team- Games- Tournament (TGT): Team- Games- Tournament (TGT) was primarily developed by David Devries and Keith Edwards as a cooperative learning method [13]. Basically, TGT has the same principle and process as STAD [14], but the test and improvement score which are used in STAD do not apply to TGT. It uses a weekly tournament game to participate in their team points by a competition between students from groups versus students from other teams who've had the same performance [12].
- Cooperative integrated and compositions (CIRC): Developed by Slavin [15] the CIRC technique is designed to improve materials for teaching, reading, writing, and other language in the upper elementary grades. CIRC provides assistance to teachers using applied traditional reading groups with two pairs from different groups. Each group is composed of a high ability pair and a low ability pair to work on specialized tasks [16].
- Jigsaw techniques: Jigsaw was developed by Aronson and others (1978). Each group in this technique consists of five or six heterogeneous members; each group member is given a topic to learn and then they discuss the material with students from other groups who worked on same part of information, which is called an "expert group." Students from the expert area return back to their team and present their information to group members. The quiz scores are based on the extent of individual achievement, so there is no particular reward for cooperative learning performance [17].
- Leaning together: Learning together, developed by David and Roger Johnson's (1994), is one of the cooperative learning models which are widely used compared with other methods. In this model, students are divided into four or five group members working on an assignment sheet to produce a single product. The cooperation can be inside and outside the group, so students can cooperate with other groups to accomplish their tasks. Finally, all members of the group are assessed based on their product [3].
- Group investigation (GI): Group investigation (GI) developed by Sharan and Sharan (1995), the group investigation model requires the learners to establish small teams and follow these guidelines: 1) The teacher introduces a general idea of the subject and provides students with resources, 2) the team outlines and plans their work, 3) the group performs their investigation, 4) the team makes their findings and plans how they can submit their feedback, 5) the team gives their presentations to the classroom, 6) evaluation of their presentations is done with the teacher [18].
- Team Assisted Individualization (TAI): Developed by Slavin (1984), TAI was designed to teach mathematics and the team consists of four or five students working on self-learning materials.

Students have full responsibility for administration, directing, checking, and solving problems. Consequently, the teacher will be free to spend his or her time guiding group members to work on similar notions. If the group achieves the presented standards, the group will receive certificates [12].

The reasons for using cooperative learning in biology teaching:

Over the past 30 years, many studies have supported the effectiveness of cooperative learning in secondary school and college students. Lord (2001) stated that out of more than 300 articles in cooperative learning in science, just 8% of these articles showed negative results through use of the cooperative method. More than 200 of the articles reported positive experiences and showed how active the members of the group were during this method of learning. It increased the enthusiasm of students for science and created more interest in comprehension of colleagues' views. There are many reasons for using cooperative learning in biology classroom such as enhances students thinking, learning environment, attitudes, understanding, reading and writing skills, Social Skills, students' values, instruction of biology[19].

4. Methodology

An extensive literature review was carried out to determine different types of learning strategies (cooperative learning particularly). A paper and pencil survey will be used to determine students' attitude towards biology and cooperative learning. After analysing the results obtained from the survey, the researcher will develop an intervention programme that would help students and teachers to implement cooperative groups in biology classroom successfully. The intervention programme consists of implementation and examination of the cooperative learning strategies incorporated into a first year pedagogy module.

5. Conclusion

Biology learners need to be actively challenged by their education. Students don't learn by being passive onlooker in the learning process. The challenge to biology instructors is not to put together amusing presentations; it is putting together challenging outlines and questions that cause students to think about what they are being taught. The Students need time to think about the challenge and they should be provided with enough time to discuss their opinions and ideas with others in their group. It is through such discussion with group members that the students will acquire new knowledge and correct their misconceptions. As this occurs, the new information is adapted with their pre-existing perceptions. This is how understanding grows in learners' minds and what good biology instruction all about.

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