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Some of the Many Options When Using the Jigsaw Technique

Algunas de las Muchas Opciones al Usar la Técnica Jigsaw

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ABSTRACT

Jigsaw (Aronson, 2025) is a well-known and widely used cooperative learning technique with support from research. Given Jigsaw's popularity, many variations have arisen, and attention to cooperative learning principles suggests the possibility of further variations. This scoping review looked at 13 studies in the past ten years that used the Jigsaw to facilitate nursing education. The research question was how participants' use of Jigsaw was organized in these studies and whether variations were used. This general question was organized into nine specific questions. To answer these questions, the 13 research reports were studied. It was found that the basic version of Jigsaw was almost always used with few variations. Based on the cooperative learning literature, the authors suggested that educators might consider variations on Jigsaw in the hope that students can use Jigsaw and other cooperative learning techniques more frequently and successfully. Examples of these variations based on nursing education are given.

Key words: Nursing education, Positive interdependence, Teaching skills, Variations of teaching techniques.

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RESUMEN

Jigsaw (Aronson, 2025) es una técnica de aprendizaje cooperativo ampliamente conocida y utilizada, respaldada por investigaciones. Dada su popularidad, han surgido muchas variantes de Jigsaw, y la atención a los principios del aprendizaje cooperativo sugiere la posibilidad de más variaciones. Esta revisión de alcance analizó 13 estudios realizados en los últimos diez años que utilizaron la técnica Jigsaw para facilitar la enseñanza en enfermería. La pregunta de investigación fue cómo se organizó el uso de Jigsaw por parte de los participantes en estos estudios y si se emplearon variaciones. Esta pregunta general se desglosó en nueve preguntas específicas. Para responderlas, se estudiaron los 13 informes de investigación. Se encontró que la versión básica de Jigsaw fue utilizada casi siempre, con pocas variaciones. Con base en la literatura sobre aprendizaje cooperativo, los autores sugieren que los docentes podrían considerar variantes de Jigsaw con la esperanza de que los estudiantes puedan utilizar esta técnica y otras estrategias de aprendizaje cooperativo con mayor frecuencia y éxito. Se presentan ejemplos de estas variaciones aplicadas a la educación en enfermería.

Palabras clave: Educación en enfermería, Interdependencia positiva, Habilidades docentes, Variaciones de técnicas de enseñanza.

INTRODUCCIÓN

Group activities, also known as small group learning, have long been a part of education. For example, Confucius, who taught about 2500 years ago, is believed to have encouraged peer learning (Nguyen et al., 2006; Tan, 2017). The last quarter of the 20th century saw a rapid growth of theory, research, and practical work in support of small group learning in education, although the modern roots of this growth can be traced at least to Dewey (1897)'s call for education to include an emphasis on learning together for the greater good. Furthermore, in the mid-20th century, Lewin (1948) and Allport (1954) had posited the value of small group interaction as a means of overcoming prejudice and resolving conflicts among people of different backgrounds.

Johnson and Johnson (1975) developed a more generalized method, called cooperative learning, from which hundreds of techniques have since been developed. Rather than focusing on techniques, however, Johnson and Johnson focused on five principles. These principles have informed the development of many techniques and variations on the techniques.

1. Positive Interdependence – the feeling among group members that their goals were positively correlated, i.e., they sink or swim together. Put another way, they feel that what helps one helps all, and what harms one harms all. Thus, groupmates who feel positively interdependent are more likely to help each other.
2. Individual Accountability – each group member feels pressure to do their fair share to enable the group to achieve its goals. Fair share does not necessarily mean equal share, as each student brings their own individual background to the group. With individual accountability, the potential for social loafing can be reduced.

3. Face-to-Face Interaction – group members need to discuss with each other in order to promote everyone's learning. This interaction should include higher order thinking. Face-to-Face Interaction contrasts with students sitting together but not interacting, e.g., each member does their part of the work without any discussion. This principle reminds us that small group learning is a learning arrangement, not a seating arrangement.
4. Cooperative Skills – Many skills are needed for promotive interaction. Just a few of these are: checking that others understand, asking for and giving explanations, disagreeing politely, providing examples, praising and thanking others, and encouraging everyone to participate. Students will likely need teacher guidance to develop and deploy these cooperative skills.
5. Processing Group Interaction – Learning effectively with others is always a work in progress. Students, not to mention their teachers, need continuous improvement. One path toward such improvement involves groups spending time discussing the quality of their interaction. What did they do well? What can they do better?

The Johnsons' five principles are not the only list of principles to guide learning in groups. For example, within cooperative learning, Slavin and colleagues, while discussing positive interdependence and individual accountability, have developed unique principles and techniques (Slavin, 1995). Lim et al. (2023) offered a list of eight cooperative learning principles. Additionally, many other methods have been developed that promote small group learning. These include, in no particular order, Problem-Based Learning (Seibert, 2021), Team-Based Learning (Ulfa et al., 2021), Collaborative Learning (Hmelo-Silver, 2013), Peer-Assisted Learning (Lewin et al., 2024), Project-Based Learning (Almulla, 2020), and Small Group Teaching (Canagaratnam, 2024).

The Jigsaw technique (Aronson & Patnoe, 1978; Blaney et al., 1977) can be traced to the work of Lewin and Allport. Here is the basic Jigsaw procedure as described by Aronson (2025).

1. Students form groups of 4-6 members. These are called Jigsaw groups or sometimes home groups and should be heterogeneous as to such variables as gender, race, ethnicity, nationality, and past achievement. Each group has an appointed leader. The content the class will study has been divided into sections corresponding with the number of students in each Jigsaw group. Each Jigsaw group member receives a different section which they read at least twice.
2. Students move to expert groups consisting of people with the same section of the class content. In their expert groups, students further study their section and rehearse in preparation for teaching it to their Jigsaw group members.
3. Expert group members return to their Jigsaw group where they teach their section to the others in the group, while the teacher floats around the class monitoring the interaction.
4. Students take an individual quiz containing items from all the sections.

The genesis of this research lies in two observations of the authors. One, teachers seem to like Jigsaw, both to use as students in courses such as the PGDHE and with their own students. Indeed, it has been observed by the authors and reported to them that even teachers who have never heard of Jigsaw or cooperative learning have, on their own, developed class activities which are very similar to Jigsaw. Two, at the same time, the

authors, from their own teaching and reading, have seen the virtues of variations on how Jigsaw is done and believe that other educators and their students could benefit from possible use of some of these variation. Therefore, the purpose of the present article is to suggest variations in how Jigsaw might be done. The goal is not to argue that any one way is better than any other way or to criticize how others do Jigsaw. The article is written in the spirit of letting many flowers bloom.

In the following sections of the article, a study is described in which a scoping review was done which examined 13 studies of the use of Jigsaw with students of nursing and related fields. The study looked at nine questions concerning Jigsaw use as described in each of the 13 studies. The results are reported and possible variations on Jigsaw are suggested with examples provided from nursing education.

MÉTODOS

The authors of the current paper, a nurse studying for a post-graduate diploma in higher education (PGDHE), and a lecturer in the PGDHE program, did a scoping review (Arksey & O'Malley, 2005) of studies of the use of Jigsaw in nursing education, located via Google Scholar and ProQuest. Criteria for selection of studies were: use of Jigsaw, involvement of students of nursing and related fields, publication of the study in the past ten years, and sufficient details about how Jigsaw was done in order to answer the questions listed below. The second author used these criteria to select studies, with the first author verifying the choices made.

A scoping review examines past literature based on specific questions. In this case, nine questions were developed based on the authors' previous knowledge of how Jigsaw might be done. The nine questions were:

1. How many students were in each Jigsaw, a.k.a. home, group?
2. Was there a group leader?
3. Were any of the many variations of Jigsaw used, or did the researchers adhere fairly closely to the basic version as detailed in Aronson (2025).
4. What rationale was given for using Jigsaw? Was it similar to that which motivated Aronson and his U.S. colleagues?
5. Was anything done in Step 4 to promote positive interdependence?
6. Was any student preparation done outside of class?
7. Any variation in Step 3?
8. Any cooperative skills, including teaching skills, taught?
9. As in the Johnsons' fifth principle, did group members discuss how the group and each individual group member functioned, as well as how members felt while doing the activity?

Then, the research reports were read to locate the answers to the research questions. The two authors worked together to confirm each other's readings of the research articles. If any disagreement arose, they discussed until agreement was obtained. The results for each of the nine questions are presented in the next section of the article.

RESULTADOS

Below, the findings of the scoping review are reported with regard to the nine questions listed above.

Question 1 - What size are the Jigsaw groups?

In the 13 studies, Jigsaw groups varied in size from four to fifteen.

Question 2 - Is a group leader appointed for the Jigsaw groups?

Among the 13 studies, few used leaders, and no other roles, outside of leader, were used.

Question 3 - Were any of the many variations of Jigsaw used, or did the researchers adhere fairly closely to the basic version as detailed in Aronson (2025)?

In all 13 studies, the basic version of Jigsaw was used, with minor exceptions.

Question 4 - What rationale was given for using Jigsaw? Was it similar to that which motivated Aronson and his U.S. colleagues?

None of the 13 studies explicitly addressed the focus of the original work on Jigsaw: reducing prejudice and promoting enhanced intergroup relations. The list of reasons given by the authors for using Jigsaw included student-centeredness, motivation, thinking skills, relationships among students, self-regulation, critical thinking, problem-solving, self-confidence, active learning, active listening, responsibility, positive interdependence, individual accountability, life-long learning, positive attitudes, safe spaces, communication skills, trust, and self-efficacy. In addition, 12 of the 13 studies looked at cognitive gains, and in all 12 cases, nursing students who studied via Jigsaw registered statistically significant gains. The 13th study (Leyva-Moral & Camps, 2016) only looked at nursing students' reactions to Jigsaw versus lecture method for the learning of research methods. In that case, the majority of students preferred the traditional approach.

Question 5 - Was anything done in Step 4 of Jigsaw to promote positive interdependence?

Based on the 13 research reports, it is not clear that any of the researchers did anything in Step 4 to promote positive interdependence.

Question 6 - Was any student preparation done outside of class?

Few of the 13 studies explicitly stated that participants had been directed to study outside of class.

Question 7 - Were there any variations on Step 3 in Jigsaw?

Step 3 in Jigsaw is when the expert group members return to their Jigsaw groups and take turns to teach what they learned. This is what took place in almost all the studies reviewed for the current paper. However, in (Ziyai & Dikmen, 2022), a quiz was done after the experts had taught, and then revision was done before the final quiz in Step 4. Plus, a practical session was done before the final quiz in order for participants to apply the knowledge they had been studying. Also, in Abd El Aliem et al. (2019), in addition to the standard procedure of experts teaching their Jigsaw group members, an expert was chosen at random to teach the entire class.

Question 8 - Any cooperative skills, including teaching skills, taught?

None of the studies of Jigsaw in nursing education reviewed here specifically discussed including these skills.

Question 9 – Did group members discuss how the group and each individual group member functioned, as well as how members felt while doing the activity?

According to the 13 research reports, students did not engage in any reflection or group processing as to

how well their group performed.

The results presented above are summarized in Table 1 and discussed in the following section of this article.

Table 1.
Summary of the Responses to the Research Questions

Research Question	Responses
1.What size are the Jigsaw groups?	Group size varied from four to fifteen.
2.Was there a group leader?	Few studies stated that leaders were used, and no other roles, outside of leader, were mentioned.
3.Were any of the many variations of Jigsaw used, or did the researchers adhere fairly closely to the basic version as detailed in Aronson (2025).	The basic version of Jigsaw was always used, with minor exceptions.
4. What rationale was given for using Jigsaw? Was it similar to that which motivated Aronson and his U.S. colleagues?	None of the 13 studies explicitly addressed the focus of the original work on Jigsaw: reducing prejudice and promoting enhanced intergroup relations. The list of reasons given by the authors for using Jigsaw included student-centeredness, motivation, thinking skills, relationships among students, self-regulation, critical thinking, problem-solving, self-confidence, active learning, active listening, responsibility, positive interdependence, individual accountability, life-long learning, positive attitudes, safe spaces, communication skills, trust, and self-efficacy.
5. Was anything done in Step 4 of Jigsaw to promote positive interdependence?	None of the researchers stated that they did anything in Step 4 to promote positive interdependence.
6. Was any student preparation done outside of class?	Few of the 13 studies explicitly stated that participants had been directed to study outside of class.
7. Were there any variations in Step 3?	In Ziyai and Dikmen (2022), a quiz was done after the experts had taught, and then revision was done before the final quiz in Step 4. Plus, a practical session was done before the final quiz in order for participants to apply the knowledge they had been studying. Also, in Abd El Aliem et al. (2019), in addition to the standard procedure of experts teaching their Jigsaw group members, an expert was chosen at random to teach the entire class.
8. Were any cooperative skills, including teaching skills, taught?	None of the studies of Jigsaw in nursing education reviewed here specifically discussed including these skills.
9. Did group members discuss how the group and each individual group member functioned, as well as how members felt while doing the activity?	None of the 13 research reports indicated that students were asked to engage in any reflection or group processing as to how well their group performed.

DISCUSIÓN

To summarize the results of this study of the use of the Jigsaw cooperative learning technique, the general finding was that in the 13 studies of Jigsaw in the teaching of nursing and related areas, researchers used the basic version of Jigsaw with few, if any variations. Below, results are restated for each of the nine research questions, along with suggestions for possible variations, accompanied by examples from nursing education.

Question 1 – Group Size

As to Question 1, group size, in general, the literature seems to support the use of groups of two and, in general, of groups of four-five or fewer, for at least two reasons. First, in smaller groups, each student can be more active. For instance, in a group of ten, if talking time is equally divided, each student speaks 1/10th of the

time, but in a group of four, they speak ¼ of the time, i.e., much more. Second, in Step 3 of Jigsaw in which students teach each other, a group of ten needs much more time to do the teaching. For instance, if each person needs three minutes to teach plus one minute for questions, a group of four needs approximately 16 minutes to do Step 3, whereas a group of ten needs 40 minutes. Perhaps Jigsaw with only two or three members per group may also be worthy of consideration.

Another point regarding group size concerns the size of the expert groups. For instance, in a class of 60 students, if there are five pieces for students to learn: Piece 1, Piece 2, Piece 3, Piece 4, and Piece 5, that means 12 members (60 divided by 5) in each of the expert groups. As noted earlier in this question, large groups restrict the amount of time that each group member has to share their ideas and receive feedback from groupmates. With large classes, one idea is to have more than one expert group for each piece of the Jigsaw. In the example above with 60 students and five pieces, three expert groups for each piece, e.g., three Piece 1 expert groups, means 15 expert groups (3 groups per 5 pieces - 3 x 5 = 15) which means four members in each expert group (60 ÷ 15 = 4). Another advantage of multiple expert groups for each piece is that the expert groups preparing to teach the same piece could compare notes and, thereby, possibly improve each other's presentations to their Jigsaw groups.

Here is a nursing education example of Jigsaw with four pieces. Nursing students engage in a case review of a child diagnosed with leukemia. The case is divided into four subtopics:

(1) What is leukemia
(2) Causes and risk factors
(3) Symptoms and diagnosis
(4) Possible treatments

In the first author's class, the 12 nurses form three Jigsaw groups of four members each, with each member assigned one of four subtopics. In a larger class, such as a class of 45, students would form 10 Jigsaw groups of four and one group of five. Then, when students move into their expert groups, there might be three expert groups for each piece. Each expert group would have either three or four members.

Question 2 – Group Leaders and Other Roles

As to Question 2 about the use of student leaders, groups, in fact, can have many leaders, as people can play many roles to help their group succeed. Indeed, the concept of distributed leadership (O'Shea, 2021) could be relevant, with each group member playing a role that helps their group. In this way, everyone acts as a leader. Roles could include facilitator (similar to the standard meaning of leader), encourager (who encourages everyone to participate), questioner (who ask questions such as "Why?", to promote deeper thinking), timekeeper (who checks the group's progress vs how much time is left), and checker (who checks that everyone understands). Checker can be especially important, as groups only succeed if everyone in the group, everyone without exception, learns.

Also, roles should rotate (Center for Teaching and Learning, n.d.). In that way, everyone has opportunities to develop in multiple ways. Thus, groups in education differ from workplace groups. In workplaces, whoever is best at a certain task will always be the person to do that task, e.g., whoever is best at presenting will always

present on behalf of the group. In contrast, in education, everyone needs to become a good presenter, questioner, facilitator, etc., and they can only improve with the practice they obtain when roles rotate.

Here is a nursing education example of Jigsaw with roles. The Jigsaw topic is mastering wound dressing skills, and the lesson is designed to develop nursing students' psychomotor competencies while fostering collaboration, accountability, and leadership. The four subtopics are: preparation and aseptic technique; wound assessment; wound cleaning and dressing application; and patient education with post-procedure care. All these subtopics focus on skills, e.g., patient education requires communication skills. Each Jigsaw group member receives material of their subtopic and then studies it before moving to their expert group.

To enhance engagement in the expert groups, students assume distinct roles. The leader coordinates preparation for teaching back in the Jigsaw groups, manages time, and facilitates discussions. The checker asks questions to check if each expert understands the expert group's subtopic and can put their understanding into words and actions for the benefit of their Jigsaw group members. The demonstrator leads skill demonstrations, using proper techniques. The encourager supports group members and fosters motivation by giving specific praise which names what groupmates have done well or how they have made progress toward doing well.

In the next step, students return to their Jigsaw groups to teach their assigned subtopic. Each expert demonstrates their skills while explaining and highlighting critical points. Groupmates observe, ask questions, and practice the demonstrated skills under the expert's guidance.

Question 3 – Variations to the Basic Jigsaw Procedure

As to Question 3, about variations in the basic Jigsaw procedure, the fact that no variations were used is not a negative. However, in the literature on Jigsaw, many variations exist. Slavin (1980) explained Jigsaw II. Here, the main difference lies in the content group study. Whereas in basic Jigsaw, each student receives only one part of the content, in Jigsaw II, everyone receives all the content but becomes an expert in only one section. Jigsaw II has many advantages. One, some material cannot be separated into parts. For example, how can students understand the end of a short story if they have not read the beginning and middle? Similarly, textbook chapters are usually written so that knowledge from near the chapter's beginning is necessary to understand later parts of the chapter. Two, if students have all the materials, they can study on their own if a Jigsaw group member is absent or abandons their responsibility to the group. Three, students have all the parts for future study, e.g., for a final exam.

Another variation on Jigsaw can be called Bring Your Own Piece (BYOP) Jigsaw (Lim et al., 2023). Here, instead of students receiving content from teachers, students find their own content based on their assigned context. With BYOP, students develop their search skills and become more independent. However, teachers might want to recommend particular websites, etc. that have useful content at levels of reading difficulty appropriate to their students. Also, members of the same expert group can assist each other in identifying useful places to search or people to ask.

A simpler version of Jigsaw is Stay Home Jigsaw. Here, no expert groups exist. Thus, each piece needs to be fairly easy to understand without the help of an expert group. A workaround is to pair students within a group of four or six so that they can help each other teach the rest of the Jigsaw group. Of course, it is important that

the lower achiever in each twosome has a substantial role in teaching the other group members.

Here is a nursing education example of the BYOP variation on Jigsaw. The overall topic is promoting awareness about diabetes prevention and management, aligning with Singapore's "War on Diabetes" campaign. In their Jigsaw groups, each participant chooses one of four causes or risk factors for diabetes in Singapore. Participants gather resources related to their chosen subtopic including personal experiences and infographics. They then move to an expert group with other nursing students who have researched the same subtopic. Within these groups, participants share what they found and how they found it. Next, they discuss key points and collaborate to develop teaching aids such as diagrams, posters, or flashcards in preparation for Step 3 of Jigsaw.

Question 4 – Rationale for the Use of Jigsaw

As to Question 4 about the authors' reasons for using Jigsaw, although none of them mentioned reducing prejudice and promoting bonding among people of different backgrounds, the authors of this article do not see that as a negative, as Jigsaw and small group learning generally have so many other reasons to recommend them. Nonetheless, it should be noted that the use of Jigsaw has been advocated for prejudice reduction in other settings, e.g., people who differ in sexuality (Jigsaw and LGBT+, n.d.), and for reducing bullying (Cowie & Wallace, 2000).

Here is a nursing education example of a rationale for Jigsaw. In Singapore nursing education, educators attempt to use classroom activities to foster enhanced intergroup relations. Of course, just as no two snowflakes are alike, intergroup relations in Singapore at the time of the writing of this article - the quarter mark of the 21st century - vary from those existing in the U.S. at the time of Jigsaw's development, at about the two-thirds mark of the 20th century.

Singapore has a strong focus on intergroup harmony. For instance, as a government website (Ministry of Home Affairs, 2025) states, [R]acial and religious harmony is vital for Singapore's social cohesion. This harmony does not come naturally – people need to take the effort to build trust and acceptance between different races and religions and protect the common space that we have." The three main racial groups in Singapore are Chinese, Malay, and Indian. All are represented in the nursing profession, along with other nationalities, including nurses and nursing students from Malaysia, Myanmar, and the Philippines. Differences in culture can be exacerbated by language differences and variations in proficiency in English: the medium of instruction. Therefore, when in-service and pre-service nurses learn in groups, attention is paid to forming groups that are heterogenous as to race, nationality, and English proficiency.

Question 5 – Promoting Positive Interdependence

As to Question 5 concerning promoting positive interdependence in Step 4 of Jigsaw, positive interdependence is one of Johnson and Johnson's five elements of cooperative learning. Indeed, they co-authored a book titled "Positive Interdependence: The Heart of Cooperative Learning" (2005), and they have developed nine ways of encouraging students to feel that they sink or swim together with their groupmates, i.e., they feel that their outcomes are positively correlated. However, in the basic Jigsaw, none of these ways are explicitly employed. Here are three.

Reward/Celebration positive interdependence means that if a group achieves their goal, everyone in the

group receives the same reward or participates in the same celebration. A group's goal on a quiz at the end of Jigsaw might be that everyone scores at least, for example, 75% on the quiz. If they achieve their goal, everyone receives 10 bonus points, so that a group member who scored 90 now has a score of 100 (90 + 10 bonus points = 100), and a student who scored 75, now has a score of 85. Instead of points, which are a form of extrinsic reward (Ryan & Deci, 2020), celebrations can be used to encourage students to help each other learn during Jigsaw lessons. Examples of celebrations include groups doing their team cheer, using their team handshake, or dancing to their team song.

A possible objection exists to the scenario at the beginning of the previous paragraph in which a group's goal involves everyone achieving a score of, for example, at least 75%. The Jigsaw.org website suggests that Jigsaw groups consist of 5-6 members who are "diverse in terms of gender, ethnicity, race, and ability." Perhaps a more accurate term, instead of "ability" is "past achievement," as the latter term suggests greater opportunity for change. For example, this article's first author would score much higher than the second author on an exam measuring proficiency in Tagalog, her native language. This does not mean that the second author could not develop a reasonable proficiency in the language, given a conducive environment. Thus, his achievement level is low, but his ability could be high.

The concern is that the group members who are lowest in past achievement might have a large mountain to climb to reach a 75% score. Thus, their groupmates might feel disadvantaged in having them in their group. An alternative that averts this issue is to use equal opportunity for success scoring (Slavin, 1995), in which each individual's score is compared to their own previous average, i.e., they are compared to themselves, known as ipsative scoring (Jacobs & Greliche, 2015), rather than to a fixed standard, e.g., 75%, i.e., criterion-referenced scoring, or to their peers' scores, i.e., norm-referenced scoring. Thus, students and their groups are rewarded based on improvement rather than absolute scores. With the equal opportunity for success, a group's goal might be that everyone improves on their past average unless their past average is 100% or another high score, in which case these high-scoring students only need to match their past average.

Returning to the topic of types of positive interdependence, Jigsaw provides a sterling example of resource positive interdependence, as each group member has a unique resource, and they need to share that resource with groupmates in order for their group to achieve its goal. In the case of Jigsaw, the resource is usually information: information given to students in basic Jigsaw, information that students find in BYOP Jigsaw, and the segment of information that students specially study in Jigsaw II. Each group member's unique resource could also be equipment, e.g., a type of bandage.

Another way to promote positive interdependence that might be appropriate in Jigsaw is called external challenge positive interdependence. The standard type of challenge involves each group competing against the other groups to be the top group in the class. That type of challenge goes against what was discussed earlier in this section in regard to ipsative scoring and equal opportunity for success. A more cooperative type of challenge fits with a principle not explicitly included in the Johnson's five principles: cooperation as a value (Lim et al., 2023). This principle expands the feeling of all-for-one, one-for-all beyond the small group to the entire class, the entire school, the entire town/city, the entire country, and beyond. Cooperation as a value suits nursing

education very well. For instance, when nursing students do Jigsaw about kidneys, their challenge could be to overcome the various ailments that afflict the kidneys.

Here is a nursing education example of promoting positive interdependence when students do Jigsaw. In Question 3, "War on Diabetes" was the theme used in the Jigsaw activity. Such a theme fits well with external challenges and positive interdependence, as nurses and other health professionals play a key role in fighting the global, escalating scourge of diabetes. In order to encourage the nurses to see doing the activity as part of their task as warriors in the worldwide fight against diabetes, instructors can review statistics on the rise of diabetes, pre-diabetes, and related diseases, as well as tell stories and ask the nurses for stories about the suffering that these diseases cause.

[Note: Many ways of encouraging students to feel positively interdependent with groupmates can be combined in the same Jigsaw lesson. For instance, Jigsaw promotes resource positive interdependence because each Jigsaw group member has a unique resource - their piece of the Jigsaw - that they need to share with their groupmates in order for their group to understand all the Jigsaw pieces.]

Question 6 – Directing Students to Study Outside of Class

As to Question 6, students being directed to study outside of class, Jigsaw can take a large amount of class time. In particular, students need to spend time trying to understand their piece of the Jigsaw and planning to teach it to their Jigsaw group members. Additionally, after experts present in Step 3, students need time to study in preparation for the quiz in Step 4. In BYOP Jigsaw, students need additional time to find the material they will read/view. Perhaps this reading/viewing, understanding, and planning could be done outside class, saving time for peer interaction in the expert groups and Jigsaw groups, along the lines of what is done with the Flipped Classroom (Chikeme et al., 2024). Such an approach fits with the ideas of Thom (2020) and other scholars who have questioned the wisdom of spending much or all of a class period on Jigsaw. Indeed, many electronic tools enable peer interaction to take place outside of class.

Here is an example of nursing education using out-of-class preparation as part of a Jigsaw. In the nursing education example for Question 1, students engaged in a case review of a child diagnosed with leukemia. Rather than taking class time for students to study their pieces, a Flipped Classroom approach could have been employed with students studying their pieces out of class. To take this a step further, some expert group communication could also be done outside of class time. As a result, doing Jigsaw would take up less class time.

Question 7 – Variations Specific to Step 3 of Jigsaw

As to Question 7 about possible variations in Step 3 of Jigsaw, concerns arise for at least two reasons. First, what if the experts did not teach well or they taught points that will not be on the Step 4 quiz? Second, what if the other Jigsaw group members did not pay careful attention or, despite paying attention, they did not understand? Perhaps teachers could do more to prepare experts. For example, guide questions help experts focus on the areas that teachers deem to be most significant. Additionally, students could be taught to use mind maps or other graphic organizers as a way to increase the clarity of their presentations. Fundamentally, in keeping with the principle of Face-to-Face Interaction, Jigsaw groups need ways to interact about the content they are teaching each other. If Step 3 consists entirely or almost entirely of a series of one-way presentations,

little learning is likely to result.

Here is a nursing education example of a variation in Step 3 of Jigsaw with Jigsaw groups of three members. The topic is based on a scenario involving a 28-year-old woman in labor, with students studying one of three subtopics: stages of labor and nursing interventions, fetal monitoring and distress recognition, and emergency situations such as postpartum hemorrhage or neonatal resuscitation. To facilitate learning in Step 3, students use a mannequin for a labor and delivery simulation. Each group member takes responsibility for their area of expertise: the stages of labor expert guide care during labor phases, the fetal monitoring expert interprets heart rate patterns and identifies signs of distress, and the emergency expert manages complications such as postpartum hemorrhage.

To promote learning between expert groups with the same piece, the Friendly Spy technique (Lim et al., 2023) can be used. After the expert groups have had time to learn together, one member per expert group is designated as Friendly Spy. Their task is to visit another expert group with the same piece. Then, the spy learns how that group plans to teach their pieces. The spy can also offer friendly advice, perhaps based on how the spy's group plans to teach. Spies then return to their own expert group and share what they learned, while the other group members report on what they learned from the spy who visited their group.

Question 8 – Teaching of Cooperative Skills

As to Question 8 about the teaching of cooperative skills, clearly cooperative skills are necessary in Jigsaw and any other form of cooperation. Teachers cannot assume that students have these skills and, even if they have the skills, will they use them? For instance, something as simple as thanking partners may often, in the experience of the authors of the present paper, be neglected. In the Johnsons' five elements, a.k.a. principles of cooperative learning, the fourth element is teaching cooperative skills. Lists of these skills, also known as collaborative, communication, or social skills, including thinking skills, run into the hundreds of skills. They include everything from praising others to comparing and contrasting to asking someone to dance.

The literature on group learning offers many suggestions on teaching cooperative skills (e.g., Issa & Hall, 2024; Jannah et al., 2024). Johnson et al. (2013) proposed a six-step procedure for teaching cooperative skills, one skill at a time.

1. Students understand the importance of the skill in their lives.
2. Students become familiar with the words and nonverbal cues they use to employ the skill.
3. Students practice the skill on their own, separate from learning the course content.
4. Students use the skill as they study the course content.
5. Students discuss their use of the skill-based on their observations of the group, a groupmate, or themself. Did they use the skill frequently and well? How could they improve?
6. Students persevere in using the skill, including outside of class. The idea is to make using the skill automatically.

Here is an example of nursing education integrating the teaching of cooperative skills into a Jigsaw lesson. The activity begins with forming balanced Jigsaw groups of doctors and nurses, with each Jigsaw group member assigned a subtopic: post-surgical assessment, pain management, patient education, or handoff protocols.

Participants then join expert groups to share insights, review case studies, and create teaching tools. For example, the pain management group might design a medication flowchart, while the handoff group simulates effective shift-change communication.

Throughout the expert phase, participants practice the cooperative skill of praising with specific examples. For instance, a member might commend a peer for clearly explaining a protocol or proposing an efficient strategy. This positive reinforcement boosts confidence, strengthens harmony, and encourages teamwork among members of different health professions. Praising others might seem like a skill for preschoolers, but the authors' experience is that praising is sadly lacking even among adult professionals. Furthermore, specific praise is often even more rare, yet specific praise provides recipients and observers with more information about what was judged to have been done well, thereby increasing the chances that these praise-worthy actions will be repeated.

Question 9 – Reflection on Group Effectiveness

As to Question 9 about reflection on group effectiveness, group processing fits with the Johnson's fifth element: during or after an activity, students spend time to discuss how well their group has functioned and what they can do individually and collectively to function even better in the future (Johnson & Johnson, n.d.).

Here is a nursing education example of Jigsaw groups discussing their experience in doing Jigsaw. The theme of this Jigsaw activity is preventing healthcare-

associated infections (HAIs) focusing on proper hand hygiene techniques. The case

centers on a dialysis catheter infection, prompting nurses to reflect on the critical role of handwashing in preventing similar events.

After Step 4, Jigsaw groups hold a discussion of their experiences, thoughts, and fears about HAIs. What is their accountability and commitment to preventing HAIs? Learners reflect on the Jigsaw lesson they just completed. What did their group do well? How could each member do more to contribute to their own and their groupmates' learning? Any feedback for the instructor about the materials and how the lesson was conducted?

CONCLUSIONES

This article investigated the use of Jigsaw, a student-centered technique, in 13 studies related to the education of nurses and people in allied professions. The researchers used nine questions to understand what variations there might be in how Jigsaw was used. The result was that in almost all the studies, Jigsaw was done in the same way. With reference to the literature in cooperative learning, suggestions were made as to possible variations that educators might want to consider when using Jigsaw. Examples of those variations were provided.

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