

ENHANCING LEARNING OUTCOMES FOR NEURODIVERSE STUDENTS THROUGH INCLUSIVE CLIL METHODOLOGIES IN MULTILINGUAL SETTINGS

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ABSTRACT

One of the most important aspects of modern teaching practice is the introduction of inclusive education, however, some students like neurodivergence face challenges that are not addressed by a conventional approach in education. This study focuses on examining the impact of the inclusive CLIL (content and language integrated learning) methodologies on neurodiversity in a multilingual classroom in terms of academic performance, cognitive development, and their social-emotional state. Considering subject content and language simultaneously, CLIL provides an exceptionally high degree of creativity resulting in active engagement and ensuring equitable participation among students in varied educational contexts. A mixed-methods approach is employed in this research, pursuing qualitative deep insights from teachers and classroom observation alongside quantitative data through standardized tests. Effective strategies such as differentiated instruction, scaffolding, and collaborative learning are evaluated for their role in meeting the unique needs of neurodiverse learners. The findings recorded outstanding gains in language skills, knowledge acquisition, and higher order processes such as thinking and reasoning, as well as improvement in socialization and reduction in anxiety. Nevertheless, issues related to developmental and resource constraints of teachers, which require follow up action, are reported in this regard. The researcher further identifies that inclusive CLIL strategies have the potential to create a quality learning landscape for neurodiverse children. These approaches encompassing 'Linguistic', 'Academic', and 'Social-emotional' dimensions allow students to gain autonomy and equip them to thrive in a fast globalizing society. It is an interesting finding that offers a direction to educators and policy makers working to enhance inclusion and innovation practices in education.

Keywords: Inclusive Education, Content and Language Integrated Learning (CLIL), Neurodiverse Learners, Multilingual Classrooms and Cognitive Development.

Neurodiversity, the umbrella term that includes children with autism spectrum disorder, children with attention deficit hyperactivity disorder, dyslexic children and other neurological differences, makes a vicious attack on conventional education practices. It claims that such deficits of cognition ought to be viewed as differences that must be embraced instead (Singer, 2016). Restructuring of the above assertion implies that all students within the system need to be

provided with adequate inclusive instructional strategies suitable to their individual needs. One of the effective strategies is Content and Language Integrated Learning (CLIL) because in an environment of many languages and cultures, which quite often is not the case, CLIL improves the teaching and learning experience. CLIL is a broad term encompassing the integration of content subject and language teaching and is consistent with the principles of inclusive

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education, that is, it provides opportunities for improving the educational outcomes for learners which are neurodiverse (Goris, Mackey and Ellis, 2023).

CLIL is a novel concept in education that combines content learning with language teaching through a foreign language. This concept also goes hand in hand with idiomatic proficiency, critical and creative skills, intercultural sensitivity, and participation (Dalton-Puffer and Nikula, 2022). In fact, with the increase in incorporation of multilingual programmes in schools, there is a growing awareness of benefits of CLIL as an approach to improving academic achievement and enhancing global citizenship education. Neurodiverse students must, however, be provided support in learning language through this approach that is relevant to the challenges and needs. Realization of CLIL and its impact in such contexts cannot be approached without a rigorous design that brings together differentiation, scaffolding, and Universal Design for Learning (UDL) principles. These strategies ensure that diverse learners are not only accommodated but are also empowered to thrive in their educational journeys (Anderson, Costa and Davis, 2023).

One of the significant principles of CLIL pedagogies is that of 'differentiation'. As the name suggests, differentiation entails developing lesson plans that are suited to the diverse needs, wishes and skills of learners. Differentiated instruction may include aids in form, such as materials, activities, and texts, which allow for interpretation in the case of neurodiverse learners. This also means that a single instructional technique is not sufficient, and this encourages the need to adapt. Scaffolding also supports students in addressing the two strategies of learning the content and acquiring the language within the context of CLIL. Chunking detailed activities into smaller

activities, together with relevant intervention at each one of them, can assist neurodiverse pupils in developing autonomy and self-esteem. This gradual release of responsibility is consistent with both the content principles of the CLIL, as well as the syllabus of the Language sections that are implemented. Multiple indicators to determine construct added value incrementally over time (Smit, Llinares and Dalton-Puffer, 2022).

The UDL principles, when applied in CLIL classrooms, help to further enhance the inclusivity. UDL suggests that students' diversity in learning approaches is catered for by providing different modes of representation, expression and engagement. For example, content can be offered in visual, auditory, and tactile, so that all students are able, regardless of cognitive profiles, to gain and process the information. Moreover, it is possible to do this with students' preferred and strong individual manners of showing understanding, for example: oral explanation, writing, or making a project (Meyer, Rose and Gordon, 2021). As desired, UDL allows outlining the flexibility – so this way, it not only helps for neurodiverse learners but also broadens the universal educational experience of the whole class. For students with a wide range of neurological abilities, the use of CLIL strategies can be effective. To begin with, when integrated with education, even the most attention-seeking and challenging language content becomes more enjoyable and relevant. Many people with a wide range of neurodiversity struggle with languages, but they tend to find relevant content interesting. Consequently, this synergistic approach enables CLIL to cultivate a strong desire in students by giving practical examples of language. Second, acquiring a subject in a foreign language requires high levels of cognitive effort which gradually leads to the improvement of executive function such as attention span, memory or

problem-solving. CLIL essentially provides a practical means to develop and enhance the aforementioned skills for neurodiverse students who possess the capability to succeed but also experience deficits in these areas (Bialystok, Craik and Luk, 2023). Third, simply practicing the CLIL model allows the students to have contact with various cultures and languages, thus helping improve their empathy and adaptability alongside their social skills. These skills are highly complementary to language learners with disabilities to socialize or communicate (Anderson, Costa and Davis, 2023).

There are challenges in the application of some inclusive CLIL approaches. An example is the unpreparedness of educators. It can be seen that teaching within a CLIL framework involves the use of blended competencies such as use of target language, being subject matter competent and being knowledgeable on inclusive practices. Therefore, these programs are pivotal in facilitating the teachers with skills and self-assurance to handle the broader aim of the CLIL framework while also catering to the neurodiversity of students (Pavón and Ellison, 2023). Furthermore, the creation of appropriate materials is still a task. Such an environment where all learners have some or the other disability requires materials that accommodate all ranges of ability and language skills and are of effective interest to the targeted learners. Assistance from other teachers and syllabus designers and even the government is needed to provide such materials (Banegas, Morton and Nikula, 2023). Assessment is one of the important facets that needs to be approached with care. Fairly judging the two variables, content and language proficiency, may be a difficult exercise for neuro-diverse students who may have atypical skill sets and may not fit so readily into assessment models. Assessment

changes such as the use of portfolios, formative assessment or peer review can give a broader and more realistic view of the progress made by the students. These may enhance privacy and personalization and reinforce the curative aspect of CLIL (Smit, Llinares and Dalton-Puffer, 2022).

To systematize the further development of CLIL strategies, it is necessary to conduct additional research about them, which may require interdisciplinary collaboration. Among these, the advantages of bundling neurodiversity, multilingualism, and CLIL research can give practical recommendations and solutions. Besides, using cutting-edge technologies like artificial intelligence and virtual reality can improve the flexibility of CLIL's implementation and its reach. Currently existing AI-enhanced platforms for teaching foreign languages can give enhanced learning assistance and feedback. Virtual reality platforms, on the other hand, can assist learners by immersing them in multilingual environments and motivating them to speak (Huang, Smith and Johnson, 2023). These are only the technological interventions that have the ability to prepare industry-ready students as it tailors itself to the requirements of the students.

To sum everything up, the implementation of non-discriminative CLIL methods in education for the improvement of learning results for children with learning disabilities is a great stride towards equity and excellence achievement. Teachers can harness the interconnectedness of differentiation, teaching aids or scaffolding and universal design for learning (UDL) to foster appeal and cultivate healthy educational settings to accommodate the needs of learners with disabilities. Teacher training, resource availability problems or assessment critiques are a few short-term challenges to be faced, but effective multi-step strategies will solve the issue. In an ever proficient globalized world, both action and

theoretical research offers diverse CLIL practices to ensure students with learning disabilities can adequately develop and reach their maximum potential.

The originality of this study is attributed to its ability to fill a huge deficit in education by investigating the relationship of neurodiversity, multilingualism and inclusive teaching methods in the context of Content and Language Integrated Learning (CLIL). The study emphasizes the need to ensure that such educational practices are developed and implemented which create such learning environments, where students with neurodiversity can succeed academically and socially, as educational institutions across the globe expand the scope of whom they serve. This study examines how effective learning can be achieved through the use of inclusive CLIL approaches and therefore, this research assists in moving forward with those educational practices that cater for the development in understanding, language and culture at the same time. They also highlight the importance of teaching students empathy, flexibility, and the development of an international outlook, which makes them ready for the new world. As educators, policy-makers and curriculum developers in the area of language use and teaching, and culture develop appropriate strategies guided by the findings, there is a likelihood for the nurturing of diversity and reducing integration barriers in the traditional education systems enhancing effectiveness and inclusiveness of education systems

Objectives of The Study

- To examine the impact of inclusive CLIL methodologies on the academic performance and cognitive development of neurodiverse students in multilingual classrooms.
- To identify and evaluate effective teaching

strategies within the CLIL framework, such as differentiated instruction and scaffolding, in meeting the unique needs of neurodiverse learners.

- To explore how inclusive CLIL practices contribute to fostering language proficiency, content mastery, and social-emotional development in neurodiverse students.

Methodology of The Study

The research utilizes a mixed methods approach which assesses the effectiveness of inclusive CLIL methodologies towards neurodiverse learners in a multilingual context. It employs an exploratory sequential mixed methods design beginning with a qualitative phase that aims to obtain comprehensive information on the teaching approaches and possible challenges related to the inclusive CLIL practices followed by the quantitative phase which aims to measure the influence of the inclusivity towards neurodiverse learners on the students' achievement, language, and social and emotional aspects. The sample comprises 60 purposive neurodiverse students clinically diagnosed with autism spectrum disorder, ADHD and dyslexia in multilingual classrooms, and 20 teachers and support staff. Focus groups with teachers were conducted to evaluate the effectiveness of CLIL in their classroom, along with observations, to determine the challenges faced in implementing the strategy, and how it shaped their teaching. Tools of assessment were employed including the Woodcock-Johnson Tests for achievement, and the Language Proficiency Index, to evaluate the academic and language performance of the participants. Moreover, social-emotional development shifts were evaluated through the use of a more specific checklist that was created for the neurodiverse students. Measuring the results

of CLIL implementation requires comparing the before and after scores using paired t-tests, and also judging the inter-group differences by employing ANOVA by age, level of language comprehension and type of neurodiversity. With regard to qualitative data, thematic analysis is used with the aim of seeking patterns and themes pertaining to claims around the effectiveness of the challenges faced while implementing inclusive CLIL approaches. The combination of approaches gives a comprehensive view of whether inclusive CLIL practices can help neurodiverse students grow academically and personally.

Findings of The Study

A. The impact of inclusive CLIL methodologies on the academic performance and cognitive development of neurodiverse students in multilingual classrooms.

This approach offers pedagogy that incorporates all aspects of content and language integrated learning. Such a theory is especially useful in an ethnically diverse and multilingual classroom. For students on the neurodiversity spectrum, particularly those with autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), dyslexia and other neurological variations, the same education methods are deemed inappropriate as for them. It is promising therefore to note that shortcomings of traditional educational approaches could be addressed through inclusive CLIL methodologies that have an element of flexibility and adaptability to educational context that may exist in multicultural society. With over 105% of children affected by learning problems and disabilities, this surely spells hope.

The Outcomes

- Improvement in Academic Performance-

Neurodiverse students academic performance has also seen growth with the introduction of Inclusive CLIL methodologies. There are students from two different language classes containing 60 neurodivergent students. Retention test scores in three core academic subjects increased by an average of twenty-three percent ($P < 0.05$) suggesting that inclusive CLIL strategies when introduced and applied in the above classes over a contiguous period of 12 weeks led to those students' improvement in their academic writing core subjects. The Language Proficiency Index (LPI) language proficiency scores increased by 18%. This suggests that with CLIL contextualized the learning of language helped retain content acquired thereafter as well as the language itself.

- Development of the Cognitive Ability- The exposure of some neurodivergent students to the CLIL approach yielded excitement among them and further, it was revealed through statistical analysis that there are improvements in cognitive abilities. Furthermore, there was an even stronger measure of improvement from CLIL in executive function tests that included assessments of attention, problem solving, and working memory with a mean change of approximately 15% with a p value lower than 0.01. These results support the idea that there are clear cognitive advantages to dealing with the type of tasks which need students to both understand the subject matter and process the language in CLIL classes, both of which are direct characteristics of regular CLIL classes.
- The Motivation and Engagement Optimization- Both direct observational data, supplemented with self-reporting from

students, revealed a considerable increase in the levels of motivation and engagement. The engagement which students' CLIL classes' lessons received was immense as there was a 20% rise in students' scores after using the predefined engagement scale. The more interactive and multimodal approaches like use of visual aids, group projects and solving real life oriented tasks were found to be the reason for more interest in the lessons for both students and educators.

- Development of Communication and Social Skills- Neurodivergent learners exhibited enhanced communication and social skills due to the implementation of CLIL strategies which use group work or collaborative problem solving. The use of the SRS to measure social skills provided evidence in support of a statistically significant

12% upturn ($p < 0.05$) in the students' interactions with others and contributions to discussions. Likewise, student teachers reported strong indicators of improvement in students' confidence and social anxiety during classwork.

- Differences in Outcomes- The improvements in results were encouraging but the research did note variations in the success of the application of CLIL approaches among students with different needs and cognitive profiles. In class learners with low communication skills or severe cognitive disabilities had less progress which points to the need for extra support and differentiation. Analysis of statistical data regarding the performance of subgroups showed that students with diverse neurological conditions differed in test score improvements by $\pm 7\%$.

Summary of Statistical Findings

Measure	Pre-Intervention Mean Score	Post-Intervention Mean Score	Percentage Improvement	Significance (p-value)
Academic Test Scores (Overall)	65	80	23%	$p < 0.05$
Language Proficiency (LPI)	70	83	18%	$p < 0.05$
Executive Function (EF) Tests	60	69	15%	$p < 0.01$
Engagement Scale	58	70	20%	$p < 0.01$
Social Responsiveness Scale (SRS)	62	69	12%	$p < 0.05$

The reports indicate that multilingual classrooms with the inclusion of CLIL methods greatly aid the academic growth and cognitive advancement of neurodiverse learners. A rise in test scores and improved proficiency suggest that social and interaction skills have also benefitted from this method. However, given the extent

of difference seen within the outcomes as well, more support will be required on a personal level for efficient teaching. All things considered, these results endorse strong support for the further development and application of inclusive CLIL approaches in different contexts.

B. Identifying and Evaluating Effective Teaching Strategies within the CLIL Framework for Neurodiverse Learners

The role of language in learning is very crucial in the Inclusive Content and Language Integrated Learning which is aimed at working within the context of a multicultural society. Students with special needs, for example, may benefit more from neurodiverse practices such as scaffolding and differentiated instruction. According to this method, every child has abilities, and every child is capable of accomplishing tasks engagingly. So, what is this remarkable new popular pedagogical method called 'Activity Based Teaching'? This teaching approach promotes 'Differentiated Instruction' meaning the teacher differentiates the mode of content presentation, materials and evaluation requirements to meet students' intellectual capabilities/learning preferences.

Neurodiverse students can effectively learn and practice content within the CLIL curriculum while also cultivating their language skills. This is achieved through differentiated pedagogy. Incorporating CLIL through Differentiated Pedagogy, CLIL highlights Not Content Language Integrated Learning. Language is employed as a tool for content delivery and its acquisition is not the primary aim but the outcome of the content provided. Neurodiverse students should be taught the same techniques. Their sibling activities for balancing audio instruction, slinercising for auditory learners during presentations, hands-on activities when necessary the physical interaction aids concentration and fracture based assessments help motivate the students. Finally, oral reports as student's showcases the work they did during groups show an no ice break meeting providing a relaxed atmosphere.

Effectiveness for Neurodiverse Learners

According to Anderson, Costa and Davis

(2023), students who were diagnosed with autism spectrum disorder and were taught in CLIL classrooms using differentiated methods showed a 20% increase in motivation and 15% increase in second language competency that students who were in non-differentiated classrooms. Students, as reported, performed better with multimodal inputs and were better able to multitask while also disabling the overload of their brains while trying to remember certain information.

- Scaffolding- One easy way to conceptualize the word 'scaffolding' is by thinking about it as an aid or help - a scaffold helps students assist them on their journey of learning new things and supports them temporarily till they develop autonomous independence. CLIL can particularly be useful with students who have learning disabilities who require the help of learning and retaining a new language while covering new concepts.

Implementation in CLIL

- Pre-Teaching Vocabulary: Giving students critical language content in advance eliminates the maths nerves language elements created during a lesson allowing them to understand better.
- Structured Tasks: Language and content can be dense for students with learning disabilities making seeing the big picture quite difficult therefore to help them break down the task into a sequence of easy ones.
- Collaborative Learning: In group activities, students with learning disabilities are distressed and withdrawn, however pairing them with other friendly students aids not only in learning but also communication.

Scaffolding Role in Neuropsychology- In a CLIL context, sentence starters and guided

discussions, together are termed as scaffolding strategies further proving effective in improving the academic performance of students across the neurodiversity spectrum. The 17% improvement in problem solving skills as well as the 12% higher level of understanding both occurred when scaffolding practices were introduced in CLIL classrooms, according to quantitative results from a 2022 survey

Combined Effect of Differentiated Instruction and Scaffolding

The combination of both differentiated instruction and scaffolding is efficient across the different dimensions of neurodiverse learners. Materials that have been differentiated offer entry points that are easy to use, and scaffolding provides students an appropriate framework to develop the skills and concepts needed in order to become more independent. For example, to study a science topic in a CLIL classroom, a neurodiverse learner may first begin learning with the use of visual aids and straight forward descriptions (differentiated instruction) then slowly work themselves into structured tasks and collaborative activities with peer assistance (scaffolding).

Challenges and Considerations

Much like every other activity, there are cons to these strategies too, things such as the resources taken or the time required to properly train a teacher also need to be focused on:

- **Preparedness Level of Teachers:** Educators seeking to be neuro educators need to take courses that ensure them to be skilled in detecting the numerous diverse needs of the student, furthermore adapting their style accordingly. Courses focusing on CLIL and Inclusion are a requisite for such professional development programs.
- **Accessibility:** Evaluating differentiated materials and constructing scaffolding tools can take a lot of time, however, it shouldn't overpower the educator's time and competency. This issue can also be solved through teamwork and collaboration.
- **Balancing Content and Language:** Balancing out the time and effort spent on learners language and content from the CLIL classroom in use also requires further improvement in instructional design.

Considering the long and short term requirements of the neurodiverse students is feasible while considering the constructs of CLIL as long as differentiated instruction and scaffolding are employed. Such interventions are likely to result in better language use and academic performance in addition to enhancing self-efficacy and autonomy in the learners. Still, their successful implementation depends on the teacher's preparedness and the availability of resources along with acceptance to inclusivity. Future lines of research and training programs ought to be developed in a manner that these methodologies can be further advanced to benefit the neurodiverse population within multilingual classrooms more optimally.

C. Exploring How Inclusive CLIL Practices Foster Language Proficiency, Content Mastery, and Social-Emotional Development in Neurodiverse Students

The Integrative Content and Language Language Practice (CLIL) pedagogy encourages the emotional and social growth of the pupils all while actively promoting their learning of new languages in a more interactive way. These multi linguistics classrooms allow for diverse students, such as those who are neurodiverse, to learn and grow in three crucial sub-fields, and they are: language achievement, emotional and social

appraisal, and mastery over a particular subject. Language Achievement- Language learning goals are set to be achieved by the application of inclusive CLIL practices that focus on contextualized and meaningful engagements. Abstract application and standalone activities is something that these neurodiverse students find difficult to partake in and language as a subject tends to center around those activities. However, the application of content focused language learning strategies tend to provide novel opportunities as they encourage authentic language use.

Core Strategies and Outcomes

- Terminology Familiarization: Vocabulary building for specific subjects has single handedly proven to assist these students with language comprehension and speech fluency.
- Interactive Aids and Examples: Multi-faceted learning approaches such as interactive activities and real life examples tend to make it easier for students to understand complicated structures of language.
- Group Activities: These types of activities tend to increase a students confidence in all means of communication, be it verbal or written.

It has been shown that CLIL settings support neurodiverse students to improve vocabulary and construct sentences an average of 20% as compared to the students in a bilingual education context (Coyle, Marsh and Hood, 2022). Moreover, hands-on activities help them in such a way that they are able to use the language with precision when required.

Content Mastery- Engaging in academic tasks alongside learning a language encourages students to engage in the subject matter by fostering CLIL. This approach is useful for

students with learning difficulties as it involves them working with the subject using a hands-on, experiential and visually rich teaching and learning process.

Key Strategies and Impacts

- Scaffolding- Learning tasks involving more than one complex idea are split into multiple parts in such a way that the learner does not exceed their cognitive capacity while engaging with this subject.
- Differentiated materials- Content of various forms such as pictures and easy texts are offered in order to enhance the learning experience of students with different cognitive styles.
- Active Learning: The use of problem-solving activities, based learning, and inquiry based tasks encourages students to self-discover topics by making the different concepts more stimulating and engaging.

STEM and social science subject test scores improve by 20% for neurodiverse students within a CLIL model, when compared to the traditional indoctrination methods. Moreover, teaching the language within the context, enables students to think critically and also aids in the retention of knowledge acquired (Dalton-Puffer and Nikula, 2022).

Social-Emotional Development

The application of CLIL techniques is of utmost importance in supporting the social and emotional development of neurodiverse learners. Such techniques create environments where there is teamwork, understanding, and community feeling within the classroom.

Important Activities and Effects

- Peer Interaction: The use of group work and collaboration activities allows neurodiverse students to engage in social activities like

working together, talking to one another, and resolving disagreements.

- Cultural Awareness: Multilingual and multicultural materials make neurodiverse students more accepting and appreciative of differences enabling them to engage in socialization with higher self-efficacy.
- Supportive Environment: Employing inclusive pedagogies which recognize what students do well and give them feedback on what they could do better encourages neurodiverse students to enhance their self-worth and be more resilient.

There is a 15% increase in social interaction and a 12% decrease in anxiety due to peer interaction for neurodiverse learners in CLIL environments as evidenced from surveys and observation (Anderson, Costa and Davis, 2023). Moreover, it has been observed that students became more emotionally stable and ready to speak during group discussions and classes.

As reported in the present CLIL model, practices with inclusive components foster language skills, content knowledge and socio-emotional growth of neurodiverse learners. Through the combination of situated language teaching, differentiated instruction and cooperative teaching, CLIL meets the specific requirements of neurodiverse students in multilingual classrooms. CLIL is holistic in that it goes beyond academic success by also developing self-confidence and communication skills relevant for students living in globalised and complex settings. To conclude the findings highlight the need for inclusive CLIL approaches being used in the pursuit of fair and effective educational opportunities.

Conclusion of The Study

The research reveals the innovative potential of including all students through CLIL approaches

in improving the learning achievement and literacy, cognitive and emotional skills, as well as general health and wellbeing of language diversity students in a foreign language setting. How well learners perform to 'learn' inside a subject 'area' through language, subject area language as an example CLIL, is able to suit different categories of learners inside the mainstream trends thereby encouraging development to take place in various facets. The results show vast improvement of neurodiverse learners in their language proficiency, content knowledge and skills, emotional recognition and relationship embracing the usefulness of differentiated approaches and scaffolds as some of the strategies that can be employed. Through integrated CLIL pedagogies, neurodiverse students are provided strategies for performing academic and social tasks, increasing their self-efficacy and increasing their opportunities to succeed in a multicultural, multilingual world. Inclusive CLIL practices do not limit themselves by providing bridging styles between languages and cognition only, the inclusive practices go a step further by providing supportive environments that encourage the embrace of differences and teamwork. Still, some professional growth, resources and individualised help are still necessary in order for us to take full advantage of CLIL. In the end, inclusive CLIL approaches are a big move forward towards providing equal, innovative education more than just achieving high academic standards but embracing compassion, persistence, and international preparedness. Perhaps this will change the way inclusive education is understood; there will be no more limits for children with different kinds of thinking and language skills for them to succeed in life. When it comes to implementation practices, they are most likely to be most effective when there is an appropriate

shift in focus during implementation to meet the latest research questions.

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