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The education of gifted students in Greece and Europe and the use of ICT

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Abstract

The purpose of this research is to study the education of gifted students in Greece and in various European countries and the role of Information and Communication Technologies (ICT) in the education of gifted students. This study is a literature review and for the writing of which were used articles from various platforms (Research Gate, google scholar etc.). The first part distinguishes giftedness from talent and also refers to the strategies to support gifted students (differentiated instruction, enrichment, grouping and concentration). While, the second part analyses the way of education of gifted students in Greece and in different European countries (e.g. Netherlands, Switzerland, Czech Republic, Slovakia etc.). Finally, the role of ICT in the education of gifted students is discussed.

Keywords: Gifted Students; Education; Greece; European Countries; ICT

1. Introduction

The education of gifted students in Greece and in Europe usually faces many similar challenges, but there are also differences in the approach and implementation of education programmes. The use of Information and Communication Technologies (ICT) in supporting these students also plays an important role.

In Greece, the education of gifted students often faces challenges due to limited resources and lack of specialised programmes. In some cases, gifted students may feel undervalued in the conventional education system. However, there are efforts to improve this situation by creating specialised programmes and adopting approaches that take into account the needs of gifted students.

In Western Europe, as in many developed countries, there is greater attention to identifying and supporting gifted students. Many countries have specific programmes to promote giftedness and provide specialised education. The use of ICT is an important tool for personalising education and supporting students' progress.

In both cases, teachers use various digital tools and applications to create customised learning experiences. Also, developing skills such as critical thinking, reflective analysis and creativity are common goals in the education of gifted learners.

In general, developing an environment that supports differentiation and the use of ICT is an important element for effective education.

1.1. Charisma or talent

Very often the term "charisma" is confused with the term "talent". FrancoisGagne, in his model of differentiation of charisma and talent makes a clear distinction between the two. According to him (Gagne, 1985), charisma is a

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prerequisite for talent, while charisma does not necessarily become talent .To make this possible a child must follow systematic learning and practice in a supportive environment. In particular, gifts are uncultivated natural abilities, while talents are specific, skills acquired through learning.

Furthermore, according to Gagné, gifts are the raw material and, thanks to exogenous (family, friends, school, etc.) and endogenous (motivation, personality, temperament) factors, they are gradually transformed into talents in the form of high performance. These factors, are presented in his work as <<catalysts>> (Merrotsy,2017). They either hinder or facilitate the evolutionary process of natural abilities into systematically developed skills.

Finally, there are four already innate gifts which are the following: the first one is intellectual (logic, judgment, thinking), the second one is creative (inventiveness, imagination), the third one is socio-emotional (perception, empathy, tact) and the fourth one is sensory-motor (auditory, coordination).

2. Strategies for supporting gifted students

2.1. Differentiated teaching

According to the common belief ,gifted students will learn on their own and adapt to educational systems>>. Less widespread, however, is the view that education systems should adapt to the needs of gifted learners and provide specific support to facilitate their integration into school. Gifted students are no different from other students; they need help to develop their potential and discover their academic and professional paths. Some studies have documented the positive effects of guidance for gifted students by teachers. Therefore, in order to support gifted students, teaching should be modified to meet their individual needs and to set individualised challenges (EuropeanCommission, 2023).

Differentiated - individualised teaching can be one of the most successful teaching strategies. More specifically, teaching can be differentiated in terms of: content (according to Bloom's Taxonomy: memory, conceptual understanding, analysis, evaluation and creation activities), process (use of auditory, visual, verbal and kinesthetic teaching aids), product (students write assignments, tests, etc.), learning environment (differentiating the classroom layout). This method focuses on how gifted students learn rather than the learning outcomes. Its aim is to create a context in which each student can exploit his or her own ways of acquiring knowledge. The learning goal may be shared but the necessary autonomy is provided for the individual student to choose the way and pace of learning. Furthermore, thanks to differentiated teaching, the self-confidence of gifted students is enhanced.Finally , some techniques of differentiated teaching are: staggered tasks (different levels of difficulty), continuous assessment (of needs and strengths), self-directed individual work, project-based learning (according to their interests).

2.2. Enrichment and Acceleration

There is a misconception that gifted students inevitably achieve academic success. More specifically, there is also the possibility that they are unfairly treated in the classroom and even that some of them drop out of education altogether; this, when they are unable to meet their special educational needs in real life situations.

For the above reasons, there are strategies that enable these students to fully develop their abilities for their own benefit and for the benefit of society. In particular, two strategies often used in the education of gifted students are enrichment and acceleration. Enrichment is seen as a 'horizontal' extension of the curriculum, while acceleration is seen as adopting a 'vertical' extension of the curriculum. More specifically, the former includes, additional activities beyond the main curriculum, specifically tailored to specific abilities and needs. On the other hand, acceleration involves an early introduction to advanced content-skills or an acceleration of the educational pace (children progress in classes or faster in lessons).The advantages and disadvantages of these two strategies will be presented below (Alexandre Rutigliano,2020).

More specifically, the enrichment strategy aims to broaden classroom activities and the curriculum with material not included in the basic education. For example, this strategy can be provided through intensive courses at universities (e.g., the University of Tampere in Finland accepts high school students who show talent in mathematics and physics). In addition, enrichment follows a set of 12 principles, one of which is that <<each student is unique and learning is meaningful when students like what they do>>. Furthermore, it aims to cultivate the following skills :in inquiry, communication, the ability to work together, positive socio-emotional behaviours (e.g. developing moral awareness). Therefore, the goal of such a strategy is to support gifted students in developing talents and abilities to the maximum extent possible. According to Heller-Sahlgren (2018), enriching the curriculum inside and outside the classroom seems to have a positive impact on gifted students. Notably, it also works very well when combined with individualized

instruction. A key advantage is that students remain in the classroom with their peers and the curriculum is tailored to the student's abilities and needs. Its only disadvantage is that the teaching staff in each school must be suitably qualified to meet the needs of the pupils successfully. The majority of researchers and educators conclude that enrichment is the most preferable strategy.

On the other hand, acceleration is one of the oldest and most common methods; it is used because the pace of basic instruction can be too slow for gifted students and has the effect of discouraging them from participating in the classroom and the educational process. In contrast, acceleration can be defined as an educational intervention based on the acquisition of higher level knowledge than the standard classroom content or as an acceleration of the pace of the material presented. Typically, acceleration involves bypassing the classroom, entering kindergarten, school or university early in order to ensure that the education received by the gifted student is appropriate to his or her abilities or potential. However, classroom bypassing does not necessarily imply a differentiated pedagogy. Therefore, acceleration tends to be seen as limited for inclusion purposes. Plus, there is a growing resistance to this practice from teachers and parents. This is because many educators argue that it has a negative impact on the socio-emotional well-being of gifted students. In particular, it creates issues of conformity and isolation.It is important that, in addition to intellectual needs, the social and emotional needs of students are supported.

2.3. Grouping

Grouping is an educational strategy that places gifted students in groups according to their academic achievements and ability levels. Its two most common forms are: within-class grouping and between-class grouping. More specifically, gifted students are placed with other gifted students in small groups or classes according to their ability levels in each subject. This is done in order to develop a complex way their potential, as this could not be achieved in mixed classes. Some examples of clustering applications are: stand-alone classes, "multi-tracked" programs (programmes in dedicated spaces with provision of specialised materials, tools and resources, recourse room), out-of-school programmes, individualised learning programmes for gifted learners, flexible grouping classes (grouping based on ability and performance level), cooperative learning and dual teaching (Matthews, Ritchotte&McBee,2013).

2.4. Concentration

Curriculum condensation is another method of differentiated instruction for gifted students.Specifically, condensation involves compressing the curriculum with the ultimate goal of reducing the amount of time students spend on information they already know while increasing the time for in-depth study of more difficult material . Therefore, this results in them delving deeper into subjects that appeal to their interests (Reis & Renzulli, 2005).

3. Gifted learners and education in Europe

3.1. Netherland

In the Netherlands, as in other European countries, gifted pupils are included in the category of pupils with special educational needs. In the Netherlands, however, there are a large number of services and organisations that offer their services both inside and outside the school. In particular, these include the production of specialised material by school teachers, the provision of enrichment courses, extracurricular activities and competitions. It is also worth noting that students are given the opportunity to skip classes and are allowed to join certain postgraduate courses at universities in the country. In schools in the Netherlands, there are psychologists and school counsellors for gifted students and if they want and need it, additional sessions are provided (Touron & Freeman 2017). Therefore, it is a country that enables these students to develop.

Also, the Ministry of Education has commissioned two organisations to act as official information centres for giftedness. The first one is addressed to primary education (CPS) and the second one to secondary education (SLO). These centres have the following responsibilities: collecting information, organising trainings and creating a network between schools, other organisations and professionals (psychologists, special educators, etc.). In addition, they organise annual meetings to inform the government about developments in the education of gifted pupils. Furthermore, local networks of primary schools providing services to gifted pupils have been established and aim to improve cooperation between schools and the organisation of services for gifted pupils.

Finally, the Dutch government is currently in the process of introducing systemic measures to provide appropriate education for gifted children across the whole spectrum of the education system. In particular, it is considering a plan , which will identify the developmental needs of pupils <<GiftednessActionPlan>>, in collaboration with parents, school boards, experts in giftedness and representatives of organisations. Its main objective is to understand the needs of gifted

students, to provide a comprehensive and appropriate education for these students and finally it is to train teachers to meet their needs (EuropeanCommission, 2023).

3.2. Finland

In Finnish legislation, gifted pupils are referred to as a category of pupils with special educational needs. One of Finland's greatest strengths is that its legislation recognises individual differences in students and individual needs and allows schools to adapt their teaching according to their age level and abilities.Some of their strategies in education are: early entry into primary schools, choosing courses different from those in the curriculum, skipping classes, taking higher level courses, acceleration, seminars and extracurricular In addition, as mentioned above in Finland differentiated teaching is applied, the system without compulsory attendance in all classes is very flexible and allows students to accelerate the curriculum according to their potential. It is worth pointing out that psychological and medical tests are required for early school admission; it is also parents who choose the school for their children that best suits their needs. In secondary education, gifted students participate in various competitions or summer courses at universities (Tirri& Kuusisto, 2013).

3.3. England

England's educational approach to gifted learners is behavioural. Gifted children spend most of their time in the mainstream classroom (especially in the 5-11 age group). Each school needs to recognise individual differences and design a curriculum to meet the needs of gifted pupils. This means that schools should meet the needs of both gifted and less able pupils. One of the ways to achieve this is to divide a classroom into groups based on students' abilities and also to support them with trained teachers (Boettger & Reid, 2015). Early entry into school, individual coaching, differentiated teaching, enriching and extending the regular curriculum by participating in university master classes, various extra-curricular clubs, museum visits, etc. are included in the school support services for gifted students. The education of gifted and talented students is included in teacher training programmes (Koshy et al., 2018).

3.4. Switzerland

The education system in Switzerland recognizes gifted students, provides information about gifted education, as well as recognizes gifted children as part of a group of students with special needs. A common practice for gifted children is acceleration, early school entry, classroom bypassing and enrichment. Gifted pupils are generally integrated into the formal classroom and in special cases may not attend compulsory education. The identification of a gifted pupil is carried out by the teacher or - in advanced classes - by a specialised psychologist (Boettger & Reid, 2015)

3.5. Czech Republic

Gifted education in the Czech Republic was not a concern until the 1990s due to social factors (Reid & Boettger, 2015). A first step was taken in 2000, with the "National Programme for the Development of Education", which mentioned the importance of educating gifted children especially in the fields of intellect, art, sports, etc. (Simonik, 2010). Subsequently, in 2004, the educational framework programme for primary education defined the role of schools in the education of gifted children and Law 561 officially recognized the education of the gifted in the country, who were included among the pupils with SEN Regarding the terminology used, according to Sekowski (2018), who analysed the terminology used in Eastern Europe regarding giftedness, the preferred terms to refer to gifted children are "gifted" and "talented". Identifying and enhancing the needs of gifted individuals is a priority of the national curriculum, because thanks to them it is considered that the country will be recognized in the midst of competition with other countries (Reid & Boettger, 2015). In this context, the recognition is done by educators and psychologists and three main practices are followed: inclusion, special classes and special schools for gifted children. The main objective is early identification, in order to be able to provide appropriate intervention in time and thus enable pupils to develop their full potential. Additional practices suggested are individualised learning programmes, acceleration, enrichment, early enrolment in primary school and skipping grades (EURYDICE, 2006). Regarding special classes within schools, only a few countries offer this possibility to pupils except the Czech Republic. In the Czech Republic, also according to the research conducted in 2010 by Simonik, it appeared that while teachers are aware of the need to provide special education to gifted children, they still claim that they have not received proper training and thus need to improvise and also claimed that it is difficult to educate gifted children within formal classes. Furthermore, in addition to the lack of appropriate education, there is neither the appropriate materials nor the conditions for the successful education of these children (Reid & Boettger, 2015). In conclusion, while there have been some initiatives towards helping gifted children, the lack of sufficient familiarity of teachers with giftedness issues and the inability to provide the necessary care, highlights that there is still much that needs to go on in order for gifted children to be able to receive the education and assistance they need to.

3.6. Slovakia

The history of gifted education in Slovakia dates back to the 1970s. The effort to investigate giftedness was implemented through the analysis of the specificities of gifted children in mathematics, language, sports and arts. However, the real changes in the education of giftedness started to occur from the 1990s (Reid&Boettger, 2015). Regarding the legislative framework, the first law was introduced in 2008 (Law 245/2008), which defined gifted students as students with SEN and allowed the establishment of special schools or special classes for children with high intelligence (Reid&Horvathova, 2016). More specifically, in the capital Bratislava, there is the School for Gifted Children and Grammar School, which is one of the few examples of educational institutions exclusively for gifted children in Europe. In general, two models of education for gifted children prevail in Slovakia: separate-all-age gifted classes (up to 12 pupils) and those that operate with the aim of integration, i.e. mixed classes. Separate sections provide enrichment courses in the core curriculum, accelerated curriculum, additional computer and English courses, engage in annual projects and, in general, the main objective is the development of higher forms of thinking (creativity and critical thinking) and the well-being of the pupils.

The main aim is to meet the SEN of gifted pupils, therefore appropriate methods, techniques, activities and approaches are applied. In other schools, the basic skills to be acquired by all children are the same, and the reason is to ensure compatibility of the curriculum in case a pupil needs to change schools. However, there is the possibility of an individualised programme or a programme aimed at a group of gifted pupils within the classroom. Research has shown that teachers are not adequately prepared to work with intellectually gifted students and university training provides them with little information on how to work with gifted students. In general, there are no teacher training programmes in giftedness and it is up to each university whether to include giftedness courses. Consequently, some courses are available, but these too have a pedagogical or psychological orientation, but not a teaching one (Reid & Horváthová, 2016). Educational courses are also organised by the country's Research Institute of Child Psychology and Pathopsychology which is the only one focusing on research into psychological aspects of child and youth development (Reid & Boettger, 2015). This, however, creates a problem in the successful and comprehensive education of gifted students and is an issue that needs to be resolved immediately in order to achieve progress and sustainability in gifted education and this is because, gifted children are the future of any country and therefore their education should not be neglected.

3.7. Greece

Formal school education in Greece is organised according to the chronological age of students as there is a perception that intellectual development is linked to the age of children. A small percentage of the student population deviates either downwards or upwards. The education of children who deviate downwards is provided in special education structures that have been developed in recent years and continue to improve. However, this is not the case for the education of upwardly mobile pupils. The special abilities of these children go unnoticed and as a result, gifted children are a problem for teachers (Vasilikopoulou, 2019) as on the one hand their potential is not utilized and on the other hand they feel bored, disinterested in lessons and may develop deviant behaviors. Gifted students experience low mood and frustration that causes them boredom and inability to adapt to the classroom, while the overly easy curriculum for them results in a loss of enthusiasm and the development of disciplinary behaviours. This boredom leads children to either develop low profiles and foolish behaviour or to display disorderly behaviour. The low achievement and boredom caused by the educational system to gifted students also results in the development of low self-esteem (Antoniou, 2009).Unfortunately, in today's Greek educational reality there is a deficit regarding the education of gifted children on a theoretical and practical basis. Especially in the Greek public school, there is neither an educational framework nor differentiated teaching for these students. Therefore, the family tries to fill this gap, i.e. the need of gifted children to learn faster, their thirst for new stimuli and diverse cognitive interests, by providing them with a range of extracurricular activities with the corresponding, of course, financial costs (Papachristou, 2020).

3.8. France

In France, according to the legislation, the integrated development of gifted children is pursued through measures that adapt education to their particular learning pace. The legislation integrates gifted students into the general education system, ensuring access to educational programmes that meet their highest level of development, without exclusion (Peristeraki & Patsiatsiadou, 2017).

According to Kilinc & Sozer's research, it appears that for a long time, charismatic education did not become widespread in France and remained in the background. However, after the publication of Delaubier's report, interest in strengthening the education of gifted students increased.

When it comes to diagnosing and assessing gifted students in France, the main responsibility lies with teachers. Great importance is attached to the observation process and if necessary, at the end of this process, the pupil is referred to a psychologist for an individual diagnosis with the family's permission. One of the most common practices of the French education system to develop the potential of gifted pupils at primary and secondary school level is, early entry into school and skipping grades. Also, in France, specially gifted students with higher achievement compared to their peers can follow an advanced curriculum tailored to their potential. In addition, they can participate in up to two courses at different levels during certain hours of the week in more advanced activities. Furthermore, there are specialised science, arts and sports classes integrated into the regular school programmes. Various extra-curricular activities are offered, such as art, sports, literature, mathematics, history, art clubs, camps and national art competitions for specially talented pupils. Support for education in these areas is provided to educational institutions, promoting their participation in extracurricular activities. In conclusion, the education of gifted students in France adopts an integrated approach, promoting collaboration with their peers without segregation (Kilinc & Sozer, 2022).

There are two types of acceleration in learning: classroom progression, where the student completes the curriculum more quickly, and the intensive programme, where students follow the programme in a shorter time through special classes. Pre-primary and primary education in France is divided into three stages, known as 'cycles': early learning (the first two years of nursery school), basic learning (the last year of nursery school and the first two years of primary school) and improvement (the last three years of primary school). The transition at each stage is determined by the teachers' council. The educational psychologist assesses the child's maturity in general and his/her ability to adapt to the teaching, social and emotional context of a classroom where the general age of the peers is older than his/her own (Vrignaud, Bonora & Dreux, 2005).

In the study by (Vrignaud, Bonora & Dreux, 2005) it is reported that, in France, there are some organisations that provide enrichment activities for gifted students outside the regular school curriculum and classroom supervision methods have experienced a trend of slowing down over the last fifty years. However, it is worth noting that, they play an important role in encouraging students to express and develop their talents, enjoy inquiry and exploration, and emphasize the importance of "school time."

In addition, international summer camps for gifted children are organised in France. The activities of the session, which lasts from 2 to 4 weeks, include lectures in various fields such as geology, archaeology, astronomy and information technologies. The lecturers come voluntarily from different countries, wishing to come into contact with intellectually exceptional children (Vrignaud, Bonora & Dreux, 2005).

4. Models for the differentiation of the analytical model programme 19

4.1. Schoolwide Enrichment Model (SEM)

The Schoolwide Enrichment Model includes suggestions for activities that can be implemented in the context of co-education of gifted children and typically developing children. It contains activities that appeal to both types of students (Renzulli & Reis, 2003). Teachers are asked to identify the particular interests of these pupils and to differentiate the common curriculum in such a way that it responds to these interests.

The model includes three types of enrichment:

- The first type offers a wide variety of general research activities and experiences
- The second type includes educational methods and materials designed to develop critical and creative thinking
- The third type includes activities of an advanced, complex level, devoting time to subjects of real interest to them and to real problems to be solved.

The first two types involve all children. The third type, however, involves only highly talented children who want to explore and solve a particular topic in depth (Renzulli & Reis, 1997).

4.2. Betts's Autonomous Learner Model (Betts, 1999)

Betts & Kercher (1999) developed a model for gifted learners in secondary education that can be applied to formal schools. The autonomous learner model includes five elements - dimensions: orientation, individual development, enrichment, seminars and in-depth independent study. During orientation, students understand their giftedness and cultivate their social skills. In the case of individual development, students are provided with opportunities to cultivate the skills needed in lifelong learning. Therefore, this dimension is crucial to the model's emphasis on creating

autonomous learners. The enrichment dimension provides students with opportunities to explore new and diverse subject areas. In seminars, students work in groups to research a topic and present it to the rest of the class and/or a larger audience. Finally, the in-depth independent study dimension allows participants to select and study in depth a topic of their choice, often with the help of a mentor.

4.3. Feldhusen's Purdue Secondary Model

The Purdue Secondary Model (1986), designed to meet the needs of gifted students in the typical secondary school setting, aims to (Feldhusen & Robinson-Wyman, 1986):

- The maximum achievement of basic skills and concepts
- Learning activities at an appropriate level and pace
- The cultivation of creative, logical and abstract thinking in problem solving
- Developing self-awareness and acceptance of their own abilities, interests and needs
- Encouraging the pursuit of higher level goals and ambitions
- Cultivating imagination and spatial skills
- To interact with other gifted, creative and talented pupils
- Developing independence and autonomy in learning
- Information about different fields of study, art and professions.

To meet these needs, the model includes a range of services for gifted children, such as counselling, seminars, career guidance, advanced classes, acceleration opportunities, as well as extracurricular activities such as summer talent development programmes. A student who participates in this program develops a personal development plan consisting of areas of strength and areas of relative weakness that need to be remediated. Feldhusen also used the needs of gifted students as the basis for a curriculum model, called the Purdue Three-Stage Model, which uniquely fits the learning needs of gifted and talented students (Feldhusen, 1980; Moon, Kolloff, Robinson, Dixon, & Feldhusen, 2009). She suggests that gifted students be grouped in instruction so that they can be with peers of high learning abilities, as they have a fast learning pace, in an environment that encourages the development of creative and critical thinking skills, problem-solving skills, and independent learning skills.

5. The education of gifted children in Germany

5.1. Historical perspective of gifted education in Germany

Gifted education in Germany has evolved over time, reflecting changes in educational philosophy, social attitudes, and government policies. Historically, Germany has recognized the importance of nurturing intellectual talent and excellence in education. The roots of modern gifted education can be traced back to the late 19th and early 20th centuries when pioneering educators such as Wilhelm von Humboldt emphasized the cultivation of individual talents and abilities within the education system (Vantourout, 2015).

During the 20th century, Germany witnessed various developments in gifted education, including the establishment of specialized schools, enrichment programs, and talent identification initiatives. However, the historical context of gifted education in Germany is also marked by periods of political upheaval and ideological shifts, such as the Nazi regime's emphasis on eugenics and racial purity, which had a significant impact on educational policies and practices (Rost, 2006).

5.2. Overview of the German educational system and its approach to gifted education

The German education system is characterized by its emphasis on academic rigor, vocational training, and educational equity. Gifted education in Germany is integrated into the broader educational framework through specialized programs, schools, and enrichment opportunities. The country's federal structure allows for regional variations in gifted education policies and practices, with each state (Bundesland) responsible for implementing its own initiatives.

German schools offer a range of support measures for gifted students, including advanced classes, talent development programs, and extracurricular activities designed to challenge and nurture their abilities. The country's approach to gifted education emphasizes the importance of early identification, individualized learning plans, and holistic support for intellectually advanced learners.

5.3. Current policies and programs for gifted education in Germany

In contemporary Germany, gifted education is governed by a combination of federal and state-level policies and regulations. Each federal state (Bundesland) has its own framework for gifted education, which may include specialized schools, talent development programs, and support services for intellectually advanced students (Arnold, 2009). The German government acknowledges the importance of promoting excellence and talent development within the education system and provides funding and resources to support gifted education initiatives.

Some notable programs and initiatives for gifted education in Germany include the "Begabtenförderungswerke" (scholarship foundations) funded by the federal government, which offer financial support and resources to gifted students pursuing higher education. Additionally, many states offer specialized schools, summer academies, and enrichment programs designed to challenge and nurture the abilities of gifted learners (Gasteiger-Klicpera, 2014).

5.4. Identification methods and criteria for giftedness in Germany

The identification of giftedness in Germany involves a comprehensive and multi-faceted approach that considers various indicators of intellectual potential, creativity, and talent. Common methods used for identifying gifted students include standardized tests, teacher nominations, observation-based assessments, and portfolio evaluations (Vantourout, 2015). Additionally, many schools in Germany employ talent development centers and specialized committees to assess students' strengths, interests, and learning needs.

The criteria for giftedness in Germany may vary depending on the context and purpose of identification. While traditional measures of cognitive ability, such as IQ tests, are often used to identify intellectually gifted students, educators and psychologists also recognize the importance of considering non-cognitive factors, such as motivation, curiosity, and perseverance, in assessing giftedness (Rost, 2006).

5.5. Challenges and criticisms of the German gifted education system

Despite its strengths, the German gifted education system faces several challenges and criticisms. One significant challenge is the lack of standardized identification procedures and criteria across different states, leading to inconsistencies and disparities in access to gifted education opportunities (Arnold, 2009). Critics argue that the current system may overlook gifted students from underprivileged backgrounds or marginalized communities, perpetuating inequalities in educational outcomes.

Moreover, there is ongoing debate about the appropriate balance between excellence and equity in gifted education. Some educators and policymakers advocate for greater inclusivity and diversity in gifted programs, while others emphasize the importance of maintaining high academic standards and fostering excellence among intellectually advanced learners (Gasteiger-Klicpera, 2014).

5.6. Differentiated instruction and programming for gifted students in Germany

In Germany, differentiated instruction and programming play a crucial role in meeting the diverse learning needs of gifted students. Educators employ a variety of strategies to challenge and engage intellectually advanced learners, including curriculum compacting, acceleration, enrichment activities, and independent study projects (Gasteiger-Klicpera, 2014). Specialized schools and programs offer advanced coursework, mentorship opportunities, and extracurricular activities designed to cultivate the talents and interests of gifted students.

6. Characteristics and Needs of Gifted Students

6.1. Overview of the characteristics and needs of gifted students

Gifted students exhibit a range of characteristics that set them apart from their peers, including exceptional cognitive abilities, advanced problem-solving skills, creativity, and a strong intrinsic motivation for learning (Gagné, 2008). These students often demonstrate a keen ability to think critically, synthesize complex information, and make connections across diverse domains of knowledge. However, along with their academic strengths, gifted students may also experience unique challenges related to perfectionism, asynchronous development, and heightened sensitivity to their environment (Webb, 2016).

6.2. Strategies for addressing the socio-emotional needs of gifted students

Recognizing the socio-emotional needs of gifted students is essential for their holistic development and well-being. Gifted individuals may grapple with issues such as perfectionism, existential concerns, peer relationships, and underachievement (Silverman, 2013). In Germany, educators and counselors employ a range of strategies to support the socio-emotional needs of gifted students, including peer mentoring programs, counseling services, and social-emotional learning initiatives. Building a supportive and nurturing learning environment that fosters resilience, self-awareness, and emotional regulation is crucial for helping gifted students thrive academically and personally.

7. Integration of ICT in German Education System

7.1. Overview of the use of ICT in German schools

The integration of Information and Communication Technology (ICT) in German schools has transformed teaching and learning practices, enhancing student engagement, collaboration, and digital literacy skills. ICT tools and resources are widely used across various educational contexts to facilitate interactive learning experiences, personalized instruction, and the exploration of diverse educational content (Eickelmann et al., 2016).

In German classrooms, educators leverage ICT to deliver curriculum content, facilitate multimedia presentations, and create interactive learning materials that cater to diverse learning styles and preferences. Students have access to digital textbooks, educational software, and online resources that provide opportunities for self-directed learning and exploration of complex topics (Becker et al., 2017).

7.2. Technological infrastructure and resources available in German schools

German schools benefit from robust technological infrastructure and resources that support the effective integration of ICT in teaching and learning. Many schools are equipped with high-speed internet access, networked computers, interactive whiteboards, and multimedia projectors, creating a conducive learning environment for digital-age learners (Becker et al., 2017).

Moreover, the German government has made significant investments in upgrading technological infrastructure in schools and providing access to digital resources and tools. This commitment to technology-enhanced learning reflects a broader national strategy to prepare students for the demands of the 21st-century workforce and foster innovation in education (Eickelmann et al., 2016).

7.3. ICT integration initiatives and policies in the German education system

The integration of ICT in the German education system is supported by various initiatives and policies aimed at promoting digital literacy, innovation, and educational equity. At the federal level, the German government has launched initiatives such as "Bildung in der digitalen Welt" (Education in the Digital World), which seeks to strengthen digital competencies among students, teachers, and educational institutions (BMBF, 2016).

Additionally, many German states (Bundesländer) have developed ICT integration frameworks and guidelines to support teachers in effectively incorporating technology into their pedagogical practices. Professional development programs, workshops, and conferences are organized to enhance teachers' ICT skills and promote innovative teaching approaches (Eickelmann et al., 2016).

Furthermore, the German education system encourages collaborative partnerships between schools, universities, and technology companies to explore emerging trends in educational technology and develop innovative solutions for teaching and learning (BMBF, 2016). These partnerships foster a culture of experimentation, creativity, and continuous improvement in the use of ICT in education.

8. ICT tools and resources for gifted esucation

8.1. Overview of ICT tools and resources used for gifted education in Germany

In Germany, the integration of Information and Communication Technology (ICT) has significantly enhanced gifted education by providing innovative tools and resources that cater to the unique learning needs of intellectually advanced students. ICT tools offer opportunities for personalized learning, enrichment, and collaboration, fostering creativity, critical thinking, and exploration among gifted learners (Frey et al., 2020).

Educators utilize a variety of ICT tools and resources to engage gifted students in meaningful learning experiences, including digital learning platforms, educational software, online courses, and multimedia resources. These tools enable educators to customize instruction, differentiate learning activities, and provide access to advanced content and challenges tailored to students' interests and abilities (Kerres&Bütof, 2016).

8.2. Examples of digital learning platforms, educational software, and online resources

Several digital learning platforms and educational software are widely used in German schools to support gifted education initiatives. One example is Moodle, an open-source learning management system that allows educators to create interactive online courses, deliver multimedia content, and facilitate collaboration among students (Moodle, n.d.). Moodle provides a flexible and customizable platform for designing differentiated instruction and personalized learning experiences for gifted students.

Another example is Khan Academy, an online platform offering a vast array of instructional videos, practice exercises, and interactive lessons across various subjects and grade levels. Khan Academy's adaptive learning technology allows students to progress at their own pace and receive immediate feedback, making it a valuable resource for gifted learners seeking to explore advanced topics and deepen their understanding (Khan Academy, n.d.).

Additionally, online resources such as TED-Ed, Coursera, and OpenStax provide access to high-quality educational content, lectures, and courses from leading experts and institutions worldwide. These resources offer gifted students opportunities to pursue independent study, engage in interdisciplinary projects, and connect with peers and mentors beyond the traditional classroom setting.

8.3. Case studies or examples of successful implementation of ICT in gifted education

Several case studies and examples demonstrate the successful implementation of ICT in gifted education in Germany. For instance, the "Leistungmacht Schule" (Excellence Makes School) initiative launched by the German government aims to promote excellence in education through the integration of ICT tools and innovative teaching practices (BMBF, 2019). Through this initiative, schools across Germany have implemented project-based learning approaches, digital portfolios, and collaborative online platforms to foster creativity, critical thinking, and problem-solving skills among gifted students.

Another example is the "MINT-EC" network, which brings together schools, universities, and industry partners to promote excellence in STEM education (MINT-EC, n.d.). MINT-EC schools leverage ICT resources and project-based learning experiences to engage gifted students in hands-on experimentation, research projects, and competitions that deepen their understanding of STEM concepts and applications.

Furthermore, the "Junior-Ingenieur-Akademie" (Junior Engineer Academy) program offers gifted students the opportunity to explore engineering and technology through hands-on workshops, digital simulations, and industry partnerships (Köller et al., 2016). By integrating ICT tools and resources into the curriculum, the program inspires students to pursue careers in STEM fields and fosters innovation and entrepreneurship.

9. Strategies for enhancing the integration of ICTs in the education of gifted children in Germany

To enhance the integration of Information and Communication Technology (ICT) in gifted education in Germany, several strategies can be implemented. Firstly, there is a need for comprehensive professional development programs and ongoing training opportunities for educators to build their digital literacy and pedagogical skills (Ertmer et al., 2012). Teachers should be equipped with the knowledge and resources to effectively leverage ICT tools and platforms to meet the diverse learning needs of gifted students.

Additionally, fostering collaboration and partnerships between schools, universities, industry stakeholders, and technology companies can promote innovation and resource sharing in gifted education (BMBF, 2019). Joint initiatives and collaborative projects can provide opportunities for research, experimentation, and the development of innovative teaching and learning practices that integrate ICT seamlessly into the curriculum.

10. Use of ICT in gifted students

The application of modern technologies is a crucial factor in developing the creative potential of gifted students. Through the use of technological tools, the creation of experiences of research and creative activity is encouraged, while

offering the possibility of activating cognitive interest through the union of theory and practice. Modern educational technologies extend the opportunities for shaping and developing children's giftedness. Educational technologies allow not only to have a purposeful educational impact on students, but also to create an enriched, personalized educational environment that promotes the development of independence and selflearning ability. Finally, the use of various educational technologies allows each child to perform his or her function and become self-aware (Rudenko et al., 2021).

In a study by Rudenko et al (2021), 70 students of all genders were followed up to study the effect of the application of modern educational technologies on the educational process and more specifically, on the development of students' giftedness. The study showed that, the integrated use of modern educational technologies contributes to the development of children's giftedness in various areas. According to the results of the study, the percentage of children who had mastered the ability of logical thinking and prediction had increased. The participants became more inventive, their vocabulary had expanded and their ability to evaluate their own and other children's work had increased. Overall, the level of giftedness of the children in the group had increased. Based on the results, they demonstrated that, by using new technologies, students improved their ability to carry out practical activities and developed motivation to develop their own giftedness, learning reflection and critical thinking towards the activity. Students also improved their ability to actively interact with friends and teachers. They showed more interest in literary, artistic and sporting skills and increased their ability to set goals for using and acquiring new knowledge. The application of modern educational technologies in the development of gifted children allows them to constructively perceive criticism, act in unstructured conditions and protect their own interests, envision and build mental images to look for alternative options (Rudenko et al., 2021).

10.1. Use of the computer

The use of the computer as a teaching tool and new technologies provide a more attractive environment for learning with more avenues for the special characteristics of gifted and intelligent students to flourish. In recent years, a new phenomenon has emerged in the field of technology and the Internet, offering new opportunities for gifted students. Computers and the ways of accessing information have been readjusted, providing different perspectives for gifted students (Uzunboylu et al., 2019) . According to research (Marino, Orkopopoulou, & Tombrou, 2017), differentiated instruction using computers motivates gifted children to reach their full potential and fully integrate into the school context. The fusion of traditional teaching with new technologies encourages the development of gifted children in the cognitive and socio-emotional domains. Many high-ability pupils tend to hide their potential in order to feel more normal. With the help of computer programs, we can extend students' interest by constructing special puzzles, mazes and 3D models.

10.2. Educational software

- Many gifted children are highly motivated, persistent and prefer individual rather than group activities, both in and out of school. An open learning environment encourages advanced learners to engage in learning, promoting the full development of their strengths.
- Wiki is an online platform that allows users to collaborate to create and modify content in a direct and easy way. A teacher can create a website for their course, adding notes, resources and exercises for their students. Students can respond and solve the exercises from home, using their computer. Through this online platform, teachers can improve and enrich their teaching. Students from the comfort of their home can use the computer to edit what the teacher uploads and solve further exercises (Marinos, Orkopopoulou & Tombrou, 2017).
- Puzzles are a popular activity for gifted students, as they are interested in solving different kinds of puzzles. In general, puzzles cover a wide range of topics and cognitive areas as they stimulate many brain cells The Jigsawpuzzle website provides online puzzles in various designs and sizes, allowing the teacher to adjust the level of difficulty according to the needs of the students. In addition, the student can monitor the picture and use a timer to measure the time needed to solve it. The puzzles cover various topics and cognitive areas, promoting visuospatial perception and being an enjoyable activity for gifted students (Marinou, Orkopopoulou & Tobrou, 2017).
- Sudoku is an educational game that can be used by a teacher via computer. The game requires players to develop thinking strategies and creative problem solving. Experts argue that such games contribute to the learning of terminology and vocabulary, the development of abstract thinking and the strengthening of memory. For example, Sudoku is useful for learning mathematics and science, as it can be adapted to other fields, such as chemistry, by replacing numbers with chemical symbols. Students with a high IQ can practice maths exercises through the game and even chemistry (Marinos, Orkopopoulou & Tobrou, 2017).
- Digital storytelling is another effective application that helps students develop their storytelling skills, improving their creativity and encouraging critical skepticism (Kontostavlou & Driga, 2023).

10.3. The digital classroom

The qualities of a traditional classroom are incorporated into a digital classroom, except that students are not spatially confined. Gifted students need an environment where they can develop their unique and specialized learning needs. Therefore, the digital classroom offers an innovative technique that can be implemented for gifted students. Also, students today are growing up alongside technology and are comfortable using laptops, mobiles and the internet from an early age. In the digital classroom, the network replaces the traditional physical space, allowing students to communicate and share ideas through online platforms (Kontostavlou & Driga, 2023).

The digital classroom is an educational environment without time and space constraints, offering an endless source of knowledge. Some features that characterise the digital classroom include the use of video, the possibility of online chat, a feature that allows students to give feedback, a dedicated whiteboard, slide presentations and collaboration tools to facilitate discussions. Gifted students take advantage of technology to search for information about their interests and easily communicate with others using social applications. Their ability to absorb and process information quickly makes them open to a wide variety of knowledge that they can apply in their own way. In addition, the digital classroom offers gifted students the opportunity to interact both inside and outside the classroom (Kontostavlou & Driga, 2023).

10.4. Online discussion

Online chat is an effective ICT method that can be successfully applied to gifted children. Students participate in virtual chat rooms where they can exchange views and ideas either synchronously or asynchronously on various topics. An effective tool for this purpose is the discussion room. Through this approach, gifted students are able to interact with other peers and share their experiences and ideas with other gifted children (Kontostavlou & Driga, 2023).

For example, online discussion forums are an essential part of online courses. These encourage higher order thinking, problem solving, critical thinking and knowledge creation among students. Moreover, asynchronous discussion groups, according to the findings of (Kontostavlou & Driga, 2023), require the presence and guidance of the instructor to develop higher-order thinking in order to be more effective. They also emphasize the importance of interaction between students, highlighting the critical role of the instructor in shaping a social and emotional atmosphere within online groups. Therefore, for gifted children, online discussion groups are a means of increasing their social interaction. Due to the rarity of gifted students, online community can facilitate communication among these children (Kontostavlou & Driga, 2023).

10.5. Mobile learning

Mobile learning is a revolutionary form of education, allowing access to educational resources anywhere and anytime. M-learning, i.e. mobile learning, exploits the potential of mobile technologies and takes place without location restrictions. Also, we live in the age of mobility, where devices such as phones and tablets are available everywhere and facilitate learning (Kontostavlou & Drigas, 2019). For this reason, education can be designed in a way that connects people to the virtual world and creates mobile learning communities. Moreover, mobile learning supports personalized learning that recognizes the different needs and capabilities of learners. In this way, learners can use time and space more effectively to extend their knowledge (Kontostavlou & Driga, 2023). Mobile technologies can support creativity, collaboration, critical learning activities and communication among students. There is great diversity in how teachers and students can use these digital media. In this way, gifted students will have access to all of these outlets to express their particular talents and be more active in the classroom (Kontostavlou & Driga, 2023).

10.6. Artificial intelligence

Personalised learning plans can be created by teachers using tools such as ChatGPT, BingAI or other genetic AIs. These tools can describe the teacher's overall impression of the student's knowledge, also incorporating feedback received from other AI learning platforms. In this way, for students who are shown to be gifted, a learning plan created by ChatGPT can include additional reading materials or suggest activities based on the student's learning style. In addition, since not all teachers have knowledge and/or experience working with gifted children, ChatGPT can also suggest study tips for gifted children or connect them with their peers with similar abilities, creating a "global online classroom" for gifted children, connecting all students identified as gifted by educational AI platforms. Finally, ChatGPT can pose challenging questions or problems and guide students to think creatively while seeking solutions, providing feedback on their strategies and problem-solving skills (Krsmanovic & Deek, 2023).

10.7. Synopsis of Digital Technologies

Last but not least, we emphasize the significance of all digital technologies in the field of education and in Gifted education, which is very effective and productive and facilitates and improves the assessment, the intervention, and the educational procedures via mobile devices that bring educational activities anywhere [33-36], various ICTs applications that are the main supporters of education [37-56], and AI, STEM, Games and ROBOTICS that raise educational procedures to new performance levers [57-64]. Additionally, the improvement and blending of ICTs with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [65-93], accelerates and improves more than educational practices and results, especially in gifted education, treating domain and its practices like assessment and intervention.

11. Conclusion

Gifted education includes specialized programs, pedagogical approaches, and support systems designed to meet the unique learning needs of intellectually advanced students. Recognising and nurturing the talents of gifted individuals is vital to maximising their potential and contributing to the intellectual and cultural development of society.

The approach in various European countries and in Greece to the education of the gifted is characterized by a focus on talent development, personalized learning and holistic support for students in various areas of giftedness, including intellectual, creative and artistic abilities. The country's education policies emphasise the importance of identifying and nurturing giftedness from an early age to foster intellectual curiosity, critical thinking skills and innovation among students.

In recent years, the integration of Information and Communication Technologies (ICT) has emerged as a key priority in German education reform efforts. ICT offers powerful tools and resources to improve teaching and learning experiences, promote digital literacy and prepare students for the challenges of the 21st century. The widespread adoption of ICT in German schools reflects a growing recognition of its potential to facilitate personalised learning, collaboration and innovation in education.

Research shows that effective integration of ICT in education can enhance student engagement, improve academic performance and promote the development of key skills such as problem solving, communication and digital citizenship (Eickelmann et al., 2016). Furthermore, ICT has the potential to address equity issues by providing equitable access to educational opportunities for students from different backgrounds (Becker et al., 2017).

In light of these developments, this essay explores the intersection of gifted education and ICT within the German education system, examining the opportunities, challenges and implications for educating intellectually advanced learners in the digital age.

Compliance with ethical standards

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The Authors proclaim no conflict of interest.

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