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Talent Development Programs for Secondary Schools: Implementation and Evaluation of a Model School

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Abstract: A school profile of talent development including model classes has been implemented at BG/BRG Keimgasse. This paper evaluates the impact of the actions taken by the school and compares the effects of both the model classes and the regular classes, with a school without a special focus on talent development. The aim of this study was to investigate the influence that the change in profile and teaching strategies had on both types of classes. This was conducted through initial qualitative interviews, followed up by quantitative questionnaires. It was found that the model classes had significantly higher scores in terms of school satisfaction, class climate, self-efficacy, mastery goal orientation, and in hope of successes, as well as scoring significantly lower on classroom pressure. This was achieved while shortening the education for the model-class students by one year and adding extracurricular activities. When comparing the regular classes at BG/BRG Keimgasse with classes from a regular school, the scores differed only slightly. This suggested that the concepts integrated at BG/BRG Keimgasse were successful in catering to the gifted students, without compromising the quality of the regular education.

Keywords: talent development programs; gifted education; actiotope model; school profile

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1. Introduction

In German-speaking Europe, gifted education has a long tradition, with measures to support gifted children dating back to the late eighteen century [1]. However, the promotion of gifted students in Austria is still limited to separate interventions [2]. Regular schooling starts in Austria at the age of six with four years of primary school. After primary school, students regularly attend four years of lower secondary school where they can decide between attending a high school or a middle school. Thereafter, students regularly attend four or five years of higher secondary school where students can decide between several school types. More details of the Austrian school system can be seen in Figure 1.

The regular schooling in Austria offers a base for talent development with its different school types, different specializations in various branches, and voluntary additional classes. Moreover, high-achieving students have the opportunity to skip grades up to three times during a student's school career, with nine years of schooling still being compulsory. Students may start earlier in school as well, if they meet certain requirements, and pass a set of tests to ensure their readiness. In terms of enrichment, it is possible to attend revolving-door programs for high-achieving students allowing them to leave their regular classroom to attend additional courses. However, this is only possible if teachers offer this possibility. Similarly, students can attend university classes during school, that will be credited later to their respective university studies. Special clubs for gifted and/or high-achieving students, studios for artistic or creative work, facilities for self-regulated learning, additional and advanced instructional offerings during and beyond the hours of normal instructions, and tutoring programs are common [1].

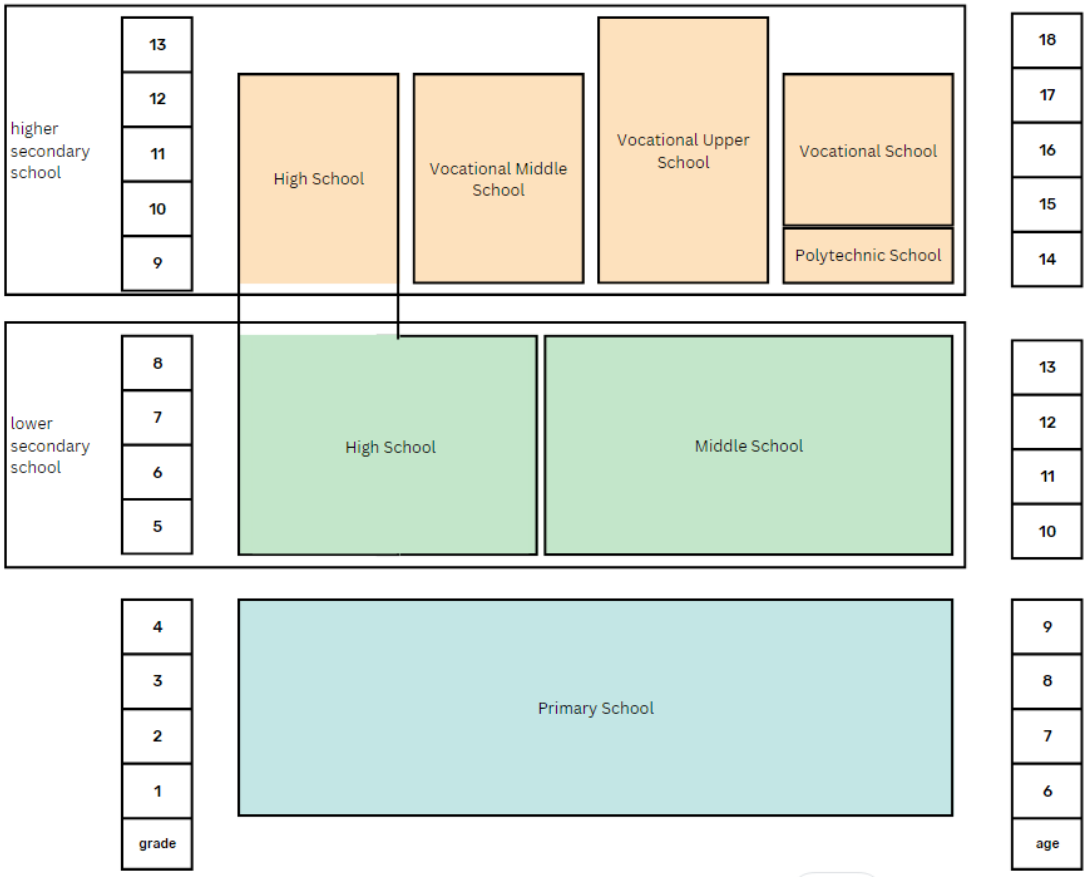

Figure 1. The regular school system in Austria with its different school types and the corresponding grades and starting age.

There is an additional supportive offer by regional coordinators in every school region: they counsel gifted students, their parents, and school boards, support school development, and organize programs for gifted students and for teachers' professional development. A comprehensive program that offers inclusive and integrated promotion throughout the educational path from primary education until university studies is still missing [2,3].

However, research shows that it is essential that gifted students have control over their learning experience regarding the educational environment, a challenging curriculum, a complexity in their learning experiences, and teachers who care about teaching and their students [4]. Most talent-development models have highlighted the significance of educational opportunities and practices in nurturing the talent of gifted individuals [5,6]. For instance, challenging educational opportunities can affect creative productivity [7]. Gifted students can acquire new knowledge quickly, understand new concepts at once, and have an excellent memory [8–10]. They often know 40–60% of the content being taught [11]. Keeping this in mind, a lot of waiting time occurs for gifted students in regular classes [12–14]. But waiting can cause boredom [4,15], leading to unsatisfactory behaviours, underachievement, and school dropout [16–18]. To counteract this trend, gifted students need support to foster their abilities and develop their talents [19–21].

The importance of this educational environment for gifted students in their development will be highlighted in this article, where a model school is presented, designed as an ideal learning system with its offerings. The school "BG/BRG Keimgasse" wants to close this gap by supporting talents throughout their secondary school years with initiatives including primary and tertiary education. The teachers at the school have developed a fundamental pedagogical principle aiming to support giftedness and talent in schools. In this paper, the school profile and the special model classes for gifted students and talent development are presented and evaluated. In this research project, the systemic inter-

ventions are evaluated in comparison with the conventional school program. In contrast to previous support measures in Austria that are usually offered separately as described before, here, the curriculum and organisation as a whole are changed and designed to promote giftedness. The learning environment of the school has been designed to promote giftedness and the authors have evaluated whether this also supports the development of giftedness in the students. For this reason, this paper also includes a systemic approach for the theoretical framework for the research.

2. Theoretical Background

2.1. Giftedness

The view of giftedness has changed considerably in recent decades. The idea of a genius blessed with inherently great talents such as high intelligence independent of the outside world has given way to a systemic perspective [22,23]. In tradition with Renzulli's historical three-ring model (1978), in which a highly gifted behaviour is seen as a combination of high intelligence, engagement, and creativity, giftedness is now generally understood as a person's potential that can be brought to fruition through the interaction of various factors [24–27]. The Munich model of giftedness by Heller and colleagues distinguishes here, for example, between noncognitive and nonsomatic personality traits (moderators), performance area (criteria), environmental characteristics (moderators), and talent characteristics (predictors) [25]. Ziegler and Stöger (2017) distinguish between exogenous and endogenous resources. Exogenous resources are economic, social, cultural, infrastructural, and didactic educational capital. Endogenous resources are organismic, attentional, telic, actional, and episodic learning capital [28].

Analogous to the described change from one-dimensional conceptions of giftedness via three-component-definitions or multidimensional models to systemic approaches, this paradigm shift can also be observed in pedagogy and didactic recommendations for talent development [29]. Gifted education and research are closely interrelated. The theoretical concepts of giftedness are and have been influenced by giftedness education and vice versa. A pedagogical approach that takes into account the multiple interrelationships and components of the system as a whole reflects our contemporary approach to the world in its complexity and system interrelationships quite well and can respond to the demands on schools in the 21st century [30]. Human beings are no longer seen as individuals with attributes assigned to them (for instance, intelligent, gifted or high achievers), but these attributes are seen in relation to the environment through which they develop, grow, are nurtured but also decline if the environment and challenges do not fit. A 21st century school should see itself as a multilayered systemic learning environment and treat its students as important parts of this system. Separative individual programmes achieve at best an analogous individual improvement. A gifted systemic environment supports the dynamic development of giftedness, as Ziegler constated, "a holistic approach has to equally address the person and the learning environment" [29]. For these reasons, a systemic model was chosen for the theoretical background of our research on the evaluation of the model school. Ziegler introduced his actiotope model of giftedness (AMG) into the scientific discourse as a framework model for the systemic connections [26,28,31–34], which is described in more detail below.

2.2. The Actiotope Model of Giftedness

Albert Ziegler's actiotope model of giftedness (AMG) [31,32] serves as the theoretical framework for this study. The AMG is a systemic model for explaining giftedness as part of the person's systemic environment. In Ziegler's model, the gifted individual is considered in constant interaction with the environment. Analogous to the concept of the biotope, whose influencing factors form the basis for the emergence and development of life forms, the AMG takes into account the various internal and external factors and their interactions, which lead to corresponding actions of a person. The AMG is a framework model for the systemic analysis of effects and interactions of various components with the individual as

the centre. These components are the action repertoire, the subjective action space, goals, and the environment in which the person acts.

A person's action repertoire is understood to be all possible actions which this person would be objectively capable of at a given point in time. The subjunctive indicates that by no means all of these potentially usable alternative actions can actually be implemented. For this to happen, a certain alternative action must (1) be considered in the first place, (2) a corresponding intention must exist, and (3) the environment must permit the execution of this action [32]. The current action repertoire describes the pool of action alternatives actually available at a certain point in time.

The subjective action space is the psychological component, which describes the possibilities for action that a person considers to be available to him or her. It comprises the action- and self-related thinking of a person, which determines which possibilities of action concretely come to consciousness. This component can also be seen as the multitude of conceivable action steps that one goes through in an anticipatory and controlling manner during action planning and action regulation [32]. The subjective action space is mainly influenced by motivational variables. For example, the degree of self-efficacy of a person can have a promoting or limiting effect. The classic phenomenon of underachievers in giftedness research [23,27] may be related to limited subjective action space. Too little ambitious goals can also be a reason here, which leads us to the next point.

The central guiding component for action selection are a person's goals. They determine the selection of those subjectively available action alternatives that appear suitable for achieving a desired result. In addition to their role as guideposts in action planning, they also function as a yardstick and regulator during action execution, in that already achieved results are compared with the desired results of action.

In addition to these first three components, which are located within the person, the environment in which a person interacts reflects the manifold external influences to which he or she is exposed. It includes all situations, structures and persons that are relevant for the formation of action intentions as well as for the execution of actions.

An important aspect of the systemic AMG approach is that all components of the actiotope are in constant interaction with each other. Thus, the subjective action space cannot be imagined independently of the current action repertoire. An expansion of the action repertoire can lead to an expansion of the subjective action space (e.g., through higher self-efficacy expectations) in the case of transparent feedback through the realistic assessment of the increased possibilities for action. Conversely, it is also possible that the elimination of motivational restrictions and thus an increase in the subjective action space enable more intensive learning experiences by setting more ambitious goals. This, in turn, leads to an expansion of the current action repertoire. All of this takes place in constant interaction with the environment, which creates the decisive conducive or restrictive situations and conditions in various structures such as family, school, or profession, in the form of parents, teachers, peers, or superiors. Since the emergence of the AMG, it has been used repeatedly as a framework in various international studies [34–36].

In order to systematize the various different variables and their interactions that are of interest in this evaluation, the AMG is ideally suited. For example, self-efficacy expectations, mastery goal orientation, and hope for success can be assigned to the subjective action space interacting with the student's goals, and the use of various learning strategies can be assigned to the students' action repertoire in combination with the subjective action space. Different goal orientations also provide information about the goals of the students as well as school satisfaction, school and classroom climate show the attitude towards the environmental component. An overview is shown in Figure 2. In the section describing the model school, the environmental component of the AMG is referred to in detail by describing the multitude of special activities at BG/BRG Keimgasse.

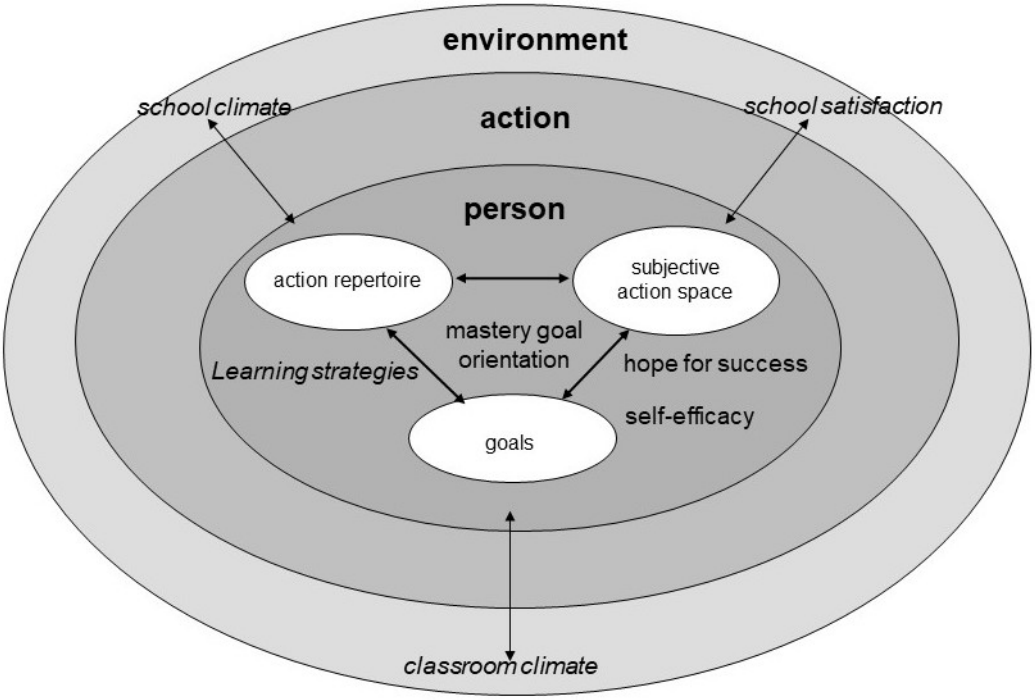

Figure 2. The actiotope model of giftedness in relationship with the different variables and their interactions that are of interest in this evaluation [32].

2.3. Guiding Principles of the Model School

Looking at the diverse interventions of BG/BRG Keimgasse (see next section), two guiding principles stand out: promoting self-regulated learning (SRL) and fostering intrinsic motivation by meeting the basic needs of Deci and Ryan's self-determination theory [37–40]. Despite a variety of theoretical approaches [41–44], SRL is generally separated into knowledge and reflective use of learning strategies (cognitive, metacognitive, and resource strategies), as well as motivational strategies such as goal reifications [45], self-efficacy [46], and affective aspects. This assumes a cyclical process of forethought, performance, and self-reflection [47,48] on learning activities in which learning can be optimized through the metacognitive strategies of monitoring and regulating the learning process. The relationship between SRL and achievement has long been documented [49].

In this study, the motivational aspects of SRL such as self-efficacy [50], mastery goal orientation [45], hope for success [51], and school satisfaction [52] were of particular interest. One of the most influential theories for promoting intrinsic motivation is SDT [53,54]. Deci and Ryan assume that three basic needs must be met in order to act intrinsically motivated: autonomy, competence, and relatedness. These basic needs have also been explored in numerous empirical studies in the context of schools [55] as well as in students' homes [56,57]. In order to prevent gifted students from losing their motivation and willingness to perform, it is important to give them a sufficient amount of autonomy so that they can use their intrinsic motivation to motivate themselves [58]. Also, studies show that a sense of competence is important for intrinsic motivation [38]; this can be achieved, for example, if the tasks have just the right level of difficulty for the students [59]. In terms of relatedness, empirical studies show that gifted students focus more on grades than on community [60], but this also often leads to cohesion among students [55]. Numerous studies show that SDT corresponds well to other theories already described, such as SRL [61]. However, SDT also provides a good framework in general with respect to giftedness [62,63]. The extent to which the interventions offered in the model school promote SRL and the fulfilment of basic needs can be understood in the following section.

3. The Model School

BG/BRG Keimgasse is located in Mödling, a city with nearly 21000 habitants in lower Austria. The school offers lower secondary and higher secondary classes with the graduation "Matura", the Austrian university entrance qualification. The school attend to 1039 students in 43 classes with 100 teachers teaching them. What is special about BG/BRG Keimgasse is the focus on promoting talents. For this purpose, a fundamental pedagogical principle was developed and employed in all classes through the schools. The principle is based on theories that address the development of expertise and best-practice examples of differentiated curricula and pedagogies for gifted and talented students referring to research that shows that this approach supports the development of giftedness [64–66]. This includes a wide range of voluntary classes, competitions, the revolving-door model and various events open to both gifted and interested students having challenges and opportunities of research in this area in mind [67]. Moreover, the school offers a special model class for gifted students that is intended for pupils with particularly good abilities who learn not only quickly but with high levels of self-motivation. The concepts of the model classes is based on acceleration and enrichment.

3.1. School Profile: Talent Development

The promotion of talents has always been a major concern of the school; therefore, a wide range of voluntary classes and events for all students and their diverse interests are offered, e.g., language certificates (Cambridge, DELF, DELE), IT classes (Lego Mindstorms, network technology, physical computing), chemistry and mathematics Olympiad, intensive classes in all foreign languages, stage play, school newspaper, musical soirée, literature competition, school academy, where all students have the possibility to perform on a big stage in the field of music, dance, sports, and stage play, or the "Long Night of Talents", where all students can show their talent to other students and train with them.

Besides these activities that are offered in the students' spare time, it is also possible to leave the regular classes for enrichment classes. The revolving-door model enables gifted students with individual elements (e.g., attending a higher school level or an extracurricular class, or work on a personal project) to further enhance the personal learning experience of each student. Moreover, students from upper secondary classes can give their own classes to students in lower secondary classes if they have special knowledge in a field. The students in these enrichment classes take over the responsibility for their own learning, with the aim of developing their full potential.

In the class "Social Learning", upper secondary students get trained to be mentors for first-grade students or to accompany students from primary schools to support them in their talent development by doing mathematical riddles together, creating stop motion videos, or philosophizing with children. This initiative aims to promote young talents but also the students from upper secondary classes.

3.2. Model Classes for Gifted Students and Talent Development

The aim of the model classes for gifted students and talent development is to offer an adequate environment for students who are particularly eager to learn. The concept for the classes in based on acceleration and enrichment. More talent-promotion initiatives are included such as special lesson design, coaching and mentoring, and quality assurance. Within the framework, learning, organizational, and didactic measures are envisaged that should support children to (self-)identify talents and promote them as well as develop their intellectual and social skills. In the next paragraphs, the main aspects of model classes are presented.

3.2.1. Acceleration

The regular lower secondary school in Austria lasts four years. In the model class, all mandatory teaching units from these four years are already taught in three years. The difference with skipping a school grade is that in the model class, no mandatory teaching

units are skipped. In the three years of lower secondary school, the same number of mandatory teaching units are completed like in the regular four years of lower secondary school. Moreover, additional classes are offered resulting in more voluntary teaching units. The model class also contributes to the socio-emotional development with a positive consolidation of the self-image of gifted students based on research [68]. This should help to prevent underachievement in the group of gifted students.

3.2.2. Enrichment

The curricula of the model classes contain only minor additions to the curricula of the regular classes. Enrichment is beneficial for all students through high levels of engagement and the use of enjoyable and challenging learning experiences that are constructed around students' interests, learning styles, and preferred modes of expression [66,69]. In particular, the scientific subjects are supplemented by practical laboratory work and the subject computer science is added. In each model class, the students work at least one week of the school year together on a class project. The topic and approach depends on the individual strengths and interests of the students. In addition to learning basic skills in project management, the focus is on getting to know the strengths of others as well as assessing one's own abilities. During the project, mandatory evaluations of the work process have to be conducted and discussed within the group. The project work ends in a presentation of the class project as part of the "Long Night of Talents" event. In the upper secondary school, "Plus Courses" can be taken and the subject "Project Module" is added. Plus courses focus on an individual topic where the class teachers are experts in the field or areas in which students have special interest. The offer is presented in a separate topic-oriented course booklet. Students from the model class have to choose at least 12 weekly lessons of plus courses in 11th (10th school year) and 12th grade (11th and final school year). Examples are body language and rhetoric; water is life: different aquatic ecosystems; sports science: training theory; training planning; social dimensions of sport; singing: the voice as a multifaceted instrument; lyrics: the power of words in music, among others. In the project module, the students work on individually chosen scientific or humanities topics. In addition to the acquisition of academic knowledge, the project module focuses on the practical learning of basic project management skills like creating a schedule, creating a project plan, and distribution of tasks.

3.2.3. Coaching and Mentoring

Each student of the model class is accompanied by a supporting teacher with appropriate coaching training. Based on research that shows the effectiveness of initiatives like these [70], it should support gifted students in their development. The coaching starts with an initial contact within the framework of the introductory days as part of a school event for the students. Afterwards, the supporting teacher and the student keep in regular contact. Supporting teachers are mostly working in the field of personality development and strengthening self-esteem and do not teach the model class regularly. The support contains mediation and conflict advice, behaviour advice and coaching, communication and cooperation (problems in the class community burdens in the family environment). To ensure the confidentiality and efficiency, the support lessons are held in individual settings. Conversations about problems in the class communities are also possible in a group setting if required. The contact teacher takes minutes of the discussions held. All students attend the first-grade course "Social Learning" led by a teacher and by mentors of the higher secondary school.

3.2.4. Lesson Design

A variety of methods are used to meet the needs of the gifted students: individualization, differentiation, open learning, among others. Students are encouraged to observe their learning behaviour and to explore different methods and areas besides the academic fields to develop in self-reliance, self-organization, error correction, strategy of research,

planning, and organization. Twice in the school year are two special weeks called FLipiK (German acronym for "Open learning individually and person-oriented in the BG/BRG Keimgasse") planned. The students of the model classes can do their assignments from all subjects individually and independently. In addition to the contents of the curriculum, creative as well as challenging tasks can be chosen. The focus in these weeks lies on the personal responsibility and self-competence of the learners, as well as the accompanied self-reflection of the learning process.

3.2.5. Quality Assurance

For quality assurance, regular internal evaluations (class conferences, feedback loops), and external evaluations (through scientific institutions such as the Austrian Research and Support Centre for the Gifted and Talented, the University of Education in Lower Austria, or the Institute for Educational Sciences at the University of Vienna) are carried out.

3.2.6. Organisational

The lower secondary school of the model class contains four grades in three years (5th to 8th grades) and the upper secondary school of the model class contains four grades in four years (9th to 12th grades). The maximum number of students allowed in the lower secondary school is 24—at most, 20 to 22 students are attending the model class. In the regular class, usually, 25 to 28 students are attending. Teachers of the model classes are trained in talent promotion or other relevant fields. Special training and regular further training in teaching methods and new approaches of teaching are mandatory for all teachers of the model classes.

3.2.7. Admission

The admissions process is carried out by external experts in the field of gifted diagnostics. The process contains the following steps: (1) getting to know each other: child, parent, psychologist, teacher; (2) standardized cognitive ability test; (3) group assignments where, among others, social learning and teamwork are observed. The evaluations of the getting-to-know step and the group assignments have to be positive and in the standardized cognitive ability test, a high ability has to be diagnosed in every giftedness domain with the threshold set as the 85th percentile. The maximum number of students allowed in the model classes is limited to 24. In the last years, around 50% of the applications for the model class met the criteria for admission.

4. Materials and Methods

In order to determine the impact of the multiple measures on students, the authors were asked by the school administration of BG/BRG Keimgasse to conduct a comprehensive evaluation in the fall of 2021. None of the authors was part of the development of the school's talent program. From 2007 to 2008, a school team under the scientific supervision of Prof. Dr Friedrich Oswald and with the support of the regional school administration developed the concept of this separative model of talent promotion. Since then, the model classes have been continuously developed and evaluated both internally and externally. The head of the model classes, Prof. Wurzer, is primarily responsible for the now established and recognized concept.

This study examined the impact of model classes and regular classes compared to a control school without a special focus on talent development. The nearby comparison school, BG/BRG Perchtolsdorf, is of the same school type as BG/BRG Keimgasse and provides lower secondary and higher secondary classes leading to the Austrian university entrance qualification, "Matura". The numbers of students (950), teachers (90), and classes (35) are comparable to those of BG/BRG Keimgasse. In addition to sharing the same geographical location, school type, admission criteria, and enrolment figures, students' socioeconomic status and the distribution of gender is similar. To gain an understanding of

the variations in talent development promotion among the two schools, Table 1 provides an overview.

Table 1. Overview of the initiatives to support talent development at BG/BRG Keimgasse and BG/BRG Perchtolsdorf.

		Model Classes BG/BRG Keimgasse	Regular Classes BG/BRG Keimgasse	BG/BRG Perchtolsdorf
Talent development school profile		X	X	
Acceleration:	Skipping classes [1]	X	X	X
	Shortening duration [2]	X		
Coaching		X	X	
Enrichment:	Class project	X		
	FLipiK project	X	X	
	Plus courses	X		
	Project module	X		
	Revolving door model	X [3]	X [3]	X [4]
	Social learning	X	X	
	Students' teaching	X	X	
	Talent classes	X	X	X
Events		X	X	X
Mentoring		X	X	
Voluntary classes		X	X	X

[1] Skipping a whole grade with all the classes in that grade. [2] Completing the lower secondary school in three years instead of the regular four without skipping classes. [3] Possible in every subject. [4] Possible only in foreign language "English".

4.1. Research Questions

The following research questions were investigated for both the lower and upper secondary grades.

Question 1: To what extent is there a difference between regular classes, model classes from BG/BRG Keimgasse, and classes from BG/BRG Perchtolsdorfwith respect to the variables school satisfaction, school climate, classroom climate, use of elaborated learning strategies (elaboration), self-efficacy, mastery goal orientation, and hope for success, which can be located in different areas of the AMG?

Question 2: Do the measures in the model classes radiate to the regular classes at BG/BRG Keimgasse ? (Is there a difference between regular classes at BG/BRG Keimgasse and BG/BRG Perchtolsdorf?)

4.2. Data Collection

For the development of the questionnaires, 30 qualitative interviews with students were conducted in January 2022. An important result of the interviews was that both model and regular students were very satisfied with their school form and that the modern instructional design was noticeable for both forms. Therefore, the evaluation design was extended to compare not only model and regular classes but also to examine another school as a control group. A detailed analysis of the interview data will be published at a later date.

Subsequently, based on the findings from the interviews, two online questionnaires were programmed on the online platform SurveyMonkey, one version for BG/BRG Keimgasse and one version for BG/BRG Perchtolsdorf, which could be won as a control group for the quantitative survey. The students worked on the questionnaire in class in June 2022. The response formats of the various scales used were standardized for this purpose. The quantitative items were answered using a sliding rule on a scale from 0 to 100. The questionnaires were checked for comprehensibility of content and form as well as functionality by means of pretests.

4.3. Data Analysis

To answer the research questions, the students of the regular classes, model classes, and the students of BG/BRG Perchtolsdorfwere compared by means of several univariate analyses of variance (ANOVAs) including post hoc tests (Bonferroni). Data analysis was performed using SPSS computer software. Since a differentiation according to individual school levels would go beyond the scope of the study, a distinction was only made between lower secondary and higher secondary levels in order to provide a more differentiated picture.

4.4. Sample

During the evaluation, the regular classes of BG/BRG Keimgasse and BG/BRG Perchtolsdorfas well as the model classes of BG/BRG Keimgasse were examined. In the lower secondary level (grades 5 to 8), 336 students from regular classes at BG/BRG Perchtolsdorf, 396 from regular classes at BG/BRG Keimgasse, and 58 students from model classes took part in the evaluation. In the higher secondary level (grades 9 to 12), there were 179 students attending a regular class at BG/BRG Perchtolsdorf, 161 students attending a regular class at BG/BRG Keimgasse, and 52 students attending a model class. The gender distribution of the survey was as follows: in the model classes of BG/BRG Keimgasse, 22 students identified themselves as female, 30 as male, and 6 students did not specify their gender identity at the lower secondary level; at the higher secondary level, 21 students identified themselves as female, 27 as male, and 4 did not specify their gender identity. In the regular classes of BG/BRG Keimgasse, 179 identified as female, 197 as male, and 20 did not specify their gender identity at the lower secondary level. At the higher secondary level, 73 identified as female, 73 as male, and 15 did not specify their gender identity. In the regular classes at BG/BRG Perchtolsdorf, 176 identified as female, 152 as male, and 8 did not identify as female or male at the lower secondary level. At the higher secondary level, 97 identified as female, 69 as male, and 13 did not specify their gender identity. An overview of the distribution of the participants can be seen in Table 2.

Table 2. Distribution of the participants of the conducted survey.

	Level [1]	**Female**	**Male**	**Other** [2]	**Total**
BG/BRG Keimgasse	I	179	197	20	396
	II	73	73	15	161
	I + II	252	270	35	**557**
BG/BRG Perchtolsdorf	I	176	152	8	336
	II	97	69	13	179
	I + II	273	221	20	**514**
Model classes	I	22	30	6	58
(BG/BRG Keimgasse)	II	21	27	4	52
	I + II	43	57	10	**109**
Regular classes	I	333	319	21	673
(BG/BRG Keimgasse- and	II	149	115	24	288
BG/BRG Perchtolsdorf)	I + II	482	434	45	**961**
Total		**525**	**491**	**55**	**1071**

[1] Level I for lower secondary level, level II for higher secondary level. [2] Students who did not mention their gender identity or did not categorize themselves as female or male.

4.5. Scale Description

The quantitative questionnaire was designed to provide as comprehensive a picture as possible of the various aspects that could be influenced by the different measures. For this purpose, scales from different questionnaires were combined in one instrument. The questionnaire was intended to serve as a basis for comprehensive school development measures, and it was possible to interview the students during class time. In this article,

we focused only on excerpts from the entire survey. The selected scales are described in Table 3. The scales used have already been used in many international and national studies and are considered to be widely known. Therefore, a satisfactory validity can be assumed. The reliabilities of the scales used can be seen in Table 3 and refer to the present sample with the adjusted scaling (0–100).

Table 3. Selected scales of the quantitative questionnaire.

Scale	Description	Cronbach's α	Sample Items
School satisfaction [71]	Students' satisfaction with school	0.68	I like being in this school. Life would be boring without school.
School Climate [72]	Students' subjective perceptions of their learning environments	0.92	The mood at our school is mostly cheerful, happy—depressed, listless. The teachers are generally friendly—unfriendly.
Classroom climate: classroom pressure [72]	Individual aspects of the learning environment in the classroom	0.81	If we don't study on weekends, we hardly accomplish what is asked of us. The teachers often explain things so quickly that you can hardly keep up.
Classroom climate: readiness to learn [72]	Individual aspects of the learning environment in the classroom	0.57 [1]	Most of the students in this class love to learn. Often, we students still talk about things that were discussed in class, even during the breaks.
Self-efficacy [50]	Students' beliefs in their capacity to act in the ways necessary to reach specific goals [2]	0.81	I can solve even difficult questions if I try hard. I am confident that I can do well on schoolwork/tests at school.
Elaboration [73]	Student self-report their learning strategies, highlights strengths and weaknesses)	0.65	I learn new terms, definitions, etc. by imagining corresponding examples and situations. I try to express the material I am learning in my own words.
Mastery goal orientation [74]	Coping behaviour and their attributions [2]	0.88	At school, I learn primarily. . . . . because many things interest me. . . . because I like to learn something new
Hope for success [51]	Elicits explicit achievement motives and covers the domains of hope for success as well as fear of failure	0.83	I enjoy working on problems that are a bit difficult for me. I am attracted by situations in which I can test my abilities.

[1] This low reliability corresponds to the published reliability. Since it is a common and proven instrument, the scale was retained. [2] This scale was developed at the Department of Educational Psychology at the University of Vienna in the course of a Sparkling Science project with the collaboration of one of the authors.

Ethics

Since the study was conducted in a school, the consent of the parents and the school administration was obtained in advance. The students were free to decide whether they wanted to participate in the study or not, and they were also free to discontinue their participation at any time. The data were processed and analysed anonymously.

5. Results

In order to answer the first two research questions, the quantitative data were examined. As mentioned earlier, the evaluation was designed to provide a comprehensive picture of many different aspects that could be influenced by the different measures to support gifted children. Therefore, within the scope of this article, it was only possible to give a selection of the results and to present the most important aspects. An overview of the results can be seen in Tables 4 and 5. The results of the ANOVAs were examined in detail by means of post hoc tests (Bonferroni).

Table 4. Mean values, standard deviations, and results of the analysis of variance for the lower secondary school.

Scale	Model Classes BG/BRG Keimgasse	Regular Classes BG/BRG Keimgasse	Control Group BG/BRG Perchtolsdorf	
	M (SD)	M (SD)	M (SD)	ANOVA, Sign.
School satisfaction	77.6_a (20.5)	67.08_b (22)	66.84_b (23)	F (2. 799) = 6.23, $p = 0.002$
School climate	77.44_a (15.1)	66.05_b (19.6)	63.83_b (19.3)	F (2.799) = 12.45, $p < 0.001$
Classroom climate—classroom pressure	46.16_a (25.43)	53.7_b (26.85)	54.3_b (27.73)	F (2.796) = 2.27, $p = 0.1$
Classroom climate—readiness to learn	57.89_a (23.58)	42.2_b (21.99)	43.79_b (22.33)	F (2.796) = 12.33, $p \leq 0.001$
Elaboration	54.15_a (24.1)	53.39_b (25.1)	54.27_b (22.8)	F (2.797) = 0.13, $p = 0.88$
Self-efficacy	80.4_a (21.9)	72.04_b (24.2)	70.82_b (24.9)	F (2.796) = 3.83, $p = 0.02$
Mastery goal orientation	67.04_a (21.8)	55.24_b (25.9)	55.74_b (24.9)	F (2.796) = 5.72, $p = 0.003$
Hope for success	59.5_a (23)	49.1_b (25)	50.46_b (25.4)	F (2.788) = 4.31, $p = 0.01$

Note: means with different subscripts differ at the $p = 0.05$ level according to Bonferroni's test.

Table 5. Mean values, standard deviations, and results of the analysis of variance for the higher secondary school.

Scale	Model Classes BG/BRG Keimgasse	Regular Classes BG/BRG Keimgasse	Control Group BG/BRG Perchtolsdorf	
	M (SD)	M (SD)	M (SD)	ANOVA, Sign.
School satisfaction	69.33_a (21.11)	61.6_b (21.62)	58.73_b (22.93)	F (2.394) = 4.65, $p = 0.01$
School climate	70.18_a (16.63)	54.26_b (19.42)	52.5_b (16.84)	F (2.395) = 20.3, $p < 0.001$
Classroom climate—classroom pressure	40_a (25.13)	64.52_b (23.98)	65.7_b (24.14)	F (2.395) = 24.42, $p < 0.001$
Classroom climate—readiness to learn	46.55_a (23.24)	34.02_b (19.05)	38.98_b (20.58)	F (2.394) = 8, $p < 0.001$
Elaboration	65.1_a (19.7)	55.49_b (24.2)	53.92_b (22.4)	F (2.395) = 4.8, $p = 0.008$
Self-efficacy	80.71_a (18.52)	72.26_b (21.22)	69.97_b (23.8)	F (2.395) = 4.8, $p = 0.009$
Mastery goal orientation	58.29_a (25.13)	47.58_b (25.12)	43.37_b (243)	F (2.393) = 7.46, $p = 0.001$
Hope for success	60.68_a (26.8)	46.13_b (27.55)	41.16_b (25.01)	F (2.393) = 11.1, $p < 0.001$

Note: means with different subscripts differ at the $p = 0.05$ level according to Bonferroni's test.

5.1. School Satisfaction

School satisfaction differed significantly between the three groups at the lower secondary level (F (2.799) = 6.23, $p = 0.002$). Satisfaction was highest in the model classes (77.6), followed by the regular classes at BG/BRG Keimgasse (67.08), and the regular classes at BG/BRG Perchtolsdorf (66.84) at about the same level. In the upper secondary level, the differences were also significant (F (2.394) = 4.65, $p = 0.01$) and followed the same pattern. Thus, the highest satisfaction was in the model classes (69.33), followed by the regular classes BG/BRG Keimgasse (61.6), and the lowest satisfaction was in the regular classes at BG/BRG Perchtolsdorf (58.73).

5.2. School Climate

The perception of the school climate was also significantly different at the lower secondary level (F (2.799) = 12.45, $p < 0.001$) as well as at the upper secondary level (F (2.395) = 20.3, $p < 0.001$). At the lower secondary level, the model classes perceived the school climate most positively (77.44), the regular classes at BG/BRG Keimgasse second most positively (66.05), and the regular classes at BG/BRG Perchtolsdorfleast positively (63.83). At the upper secondary level, it was also the model classes that had the most positive impression (70.18) of the school climate, although this was no longer as pronounced as in the primary level sample. As for the lower secondary level, the regular classes of the upper secondary level at BG/BRG Keimgasse (54.26) had a slightly but not significantly more positive impression of the school climate than the regular classes of the upper secondary level at BG/BRG Perchtolsdorf.

5.3. Classroom Climate

Regarding class climate, the difference in the subscale classroom pressure was not significant at the lower secondary level (F (2.796) = 2.27, $p = 0.1$), but this was assessed as significantly different at the higher secondary level (F (2.395) = 24.42, $p < 0.001$). Thereby, the model classes at the upper secondary level rated the teaching pressure the lowest (40), followed by the regular classes from BG/BRG Keimgasse (64.52). The regular classes from BG/BRG Perchtolsdorfrated the teaching pressure slightly but not significantly higher (65.7) at about the same level.

The subscale readiness to learn also showed that it was significantly (lower secondary: F (2.796) = 12.33, $p \leq 0.001$; upper secondary: F (2.394) = 8, $p < 0.001$) higher in the model classes of both lower secondary and upper secondary levels (lower secondary: 57.89; upper secondary: 46.55) than in the regular classes of both schools (lower secondary BG/BRG Keimgasse: 42.42; upper secondary BG/BRG Keimgasse: 34.02; lower secondary BG/BRG Perchtolsdorf: 43.79; upper secondary BG/BRG Perchtolsdorf: 38.98).

5.4. Elaboration

In the scale elaboration, there were no significant differences at the lower secondary level (F (2.797) = 0.13, $p = 0.88$) but there were at the upper secondary level (F (2.395) = 4.8, $p = 0.008$). At the lower secondary level, the values of the three samples were similar: the model classes had a value of 54.15, the regular classes of BG/BRG Keimgassehad a value of 53.39, and the regular classes in BG/BRG Perchtolsdorfhad a value of 54.27. At the upper secondary level, on the other hand, the model classes had the highest value of 65.1, followed by the regular classes in BG/BRG Perchtolsdorfwith 55.49, and the regular classes in BG/BRG Keimgassehad the lowest value of 53.92.

5.5. Self-Efficacy

Significant differences were evident in self-efficacy at both lower secondary (F (2.796) = 3.83, $p = 0.02$) and upper secondary levels (F (2.395) = 4.8, $p = 0.009$). At the lower secondary level, the model classes had the highest value of 80.4, followed by the regular classes of BG/BRG Keimgasse with 72.04, and the regular classes from BG/BRG Perchtolsdorf (70.82). At the upper secondary level, there was a similar picture: the model classes had a value of 80.71, followed by the regular classes of BG/BRG Keimgasse with 72.26, and the regular classes from BG/BRG Perchtolsdorfwith 69.97 at a similar level.

5.6. Mastery Goal Orientation

There was a significant difference in mastery goal orientation both at the lower secondary level (F (2.796) = 5.72, $p = 0.003$) and at the upper secondary level (F (2.393) = 7.46 $p = 0.001$). At the lower secondary level, it could be seen that the students of the model classes (67.04) had a higher mastery goal orientation than the students of the regular classes at BG/BRG Keimgasse (55.24) and the regular classes at BG/BRG Perchtolsdorf (55.74). The same effect could be seen at the upper secondary level but somewhat weaker; there,

the model classes (58.29) had a higher mastery goal orientation than the regular classes at BG/BRG Keimgasse (47.58) or at BG/BRG Perchtolsdorf (43.37).

5.7. Hope for Success

The model classes differed significantly from the two regular classes at the lower secondary level in terms of hope for success (F (2.788) = 4.31, $p = 0.01$). On this scale, the model classes at the lower secondary level had the highest scores (59.51) followed by the regular classes from BG/BRG Perchtolsdorf (50.46), and just below that, the regular classes from BG/BRG Keimgasse (49.11). At the upper secondary level, all three samples differed significantly (F (2.393) = 11.1, $p < 0.001$); there also, the model classes had the highest value (60.68) followed by the regular classes from BG/BRG Keimgasse, and a slightly lower value for the regular classes from BG/BRG Perchtolsdorf (41.16).

6. Discussion

To address the first research question about the differences between regular classes, model classes from school A, and classes from school B with respect to the variables which can be located in different areas of the AMG, the various measures to promote giftedness at BG/BRG Keimgasse appeared to be having the intended effect. Thus, significantly better values were observed in the model classes than in the regular classes of BG/BRG Keimgasse and BG/BRG Perchtolsdorfin the areas of school satisfaction, school climate, classroom climate, the use of elaborated learning strategies (elaboration), self-efficacy, mastery goal orientation, and hope for success.

Our results are consistent with findings from several studies [75] that collectively show that high-ability students benefit from ability groupings such as the model class here. Looking specifically at evaluation studies of enrichment programs and their effects on participants' self-concept and self-esteem, however, we find mixed findings [75]. While some studies found no effects, others even found a reduction. Such decline is typically also found in support measures with ability grouping and explained via social comparison (see also the big-fish–little-pond effect, [75]. In our study, on the other hand, we were able to document that the grouping of gifted students in special classes did not actually lead to any loss in the assessment of their own abilities.

Regarding question 2, the assumption which derived from the interviews that the teaching forms of the model classes would radiate to the regular classes of BG/BRG Keimgasse could not be confirmed by the quantitative data. However, it should be noted that BG/BRG Perchtolsdorf, which served as a control group, was also a highly renowned school in the same area. For further research, a more representative cross-section of several Austrian schools would be useful as a control group.

If the individual variables are examined in the context of the measures implemented in the model classes against the background of the AMG [31], the interactions between the three basic needs from the SDT (e.g., [40]) and the areas of the SRL become obvious. The majority of school-based measures (e.g., project work, plus courses, FlipiK—offered from the environmental component of the AMG) are entirely focused on students learning autonomously (SDT) and self-directedly (SRL). Thus, it can be assumed that the independent elaboration of different topics promotes the use of elaborated learning strategies [41] and the individual working speed makes competence experiences more easily possible. In addition, it could be assumed that the positive perception of environmental variables such as school and classroom climate (fostered by social courses as environmental offer) and the associated high level of school satisfaction (relatedness, SDT) have an effect on the subjective action space of the students, who approach school tasks with higher self-efficacy and hope for success, both important motivational aspects in SRL. Thus, it is obvious that students' goals lie in the acquisition of knowledge and skills rather than in simply completing school requirements (mastery goal orientation SRL, competence, SDT). This is also accompanied by the use of more elaborate learning strategies [41] and thus an increase in the student's action repertoire (competence). However, this is only one of the many

possible interactions that are conceivable between the individual areas. With its systemic, holistic view, the AMG assumes intensive interactions between all areas. Even though it is therefore not always possible to clearly assign individual areas in the AMG, it is clear from the data that the modern, scientifically based approach to promoting giftedness at BG/BRG Keimgasse has a highly positive effect on the students' actiotope.

Expertise is described by other research [29] as a process of adaptation to certain environments. In order to examine and analyse expertise as a process in a more differentiated way, the concepts of educational and learning capital are introduced as endogenous and exogenous resources (and subsequently recommended for practical talent development). In the context of our survey, this means that we collected data on the following individual aspects of the regulatory processes required for expertise: cultural (values, thought patterns, guiding principles), social (people), infrastructural (material), and didactic (know-how for designing and improving educational and learning processes) educational capital [29], which was measured with school satisfaction, school climate, and classroom climate. The endogenous resource, the learning capital, is divided by [29] into organismic, actional, telic, episodic, and attentive, measured with the use of elaborated learning strategies (elaboration), self-efficacy, mastery goal orientation, and hope for success.

The present results are of particular importance in Austria, because they represent the first systematic full-scale study of a whole school with the focus on gifted education, with a control group. In order to encourage schools to introduce gifted education, it is of immense importance to provide robust evidence for the success of such interventions. Due to the systemic perspective against the background of the AMG, the effects and interactions of the various measures described could be highlighted. Since the effect of such programs is always under discussion, we hope that this study will provide evidence for the effectiveness of such measures and that this best practice example will provide other schools with the theoretical and practical background for designing more gifted education programs.

7. Conclusions

Through the initial interviews, it was shown that at BG/BRG Keimgasse, both students in the regular and the model classes found their school structure advantageous. The modern lesson designs and teaching style were appreciated not only by the model-class students but by the regular students as well, who also received lessons from teachers involved with teaching the model classes. It also became evident that the enrichment efforts in the model classes were highly appreciated by the students, together with the shortened school duration, whilst the lower pressure in the classrooms and the fewer hours at school were seen as positive by the regular-class students. It is worth noting that both regular-class students and model-class students expressed that there was little contact between the two groups. Moreover, the interviews highlighted the importance of including another secondary school for a comparison of the questionnaires, to better understand how the modern forms of teaching and the splitting of the school intro regular and model classes affected the regular classrooms.

The results of the final questionnaires showed significant increases in class climates, readiness to learn, elaboration, mastery goal orientation and hope for success, when comparing the model classes to the regular classes. This points towards a successful implementation of the acceleration, enrichment, coaching and mentoring, lesson design, and quality assurance. The lower perceived classroom pressure of the model classes suggests a well-functioning admission policy and a good organization of the classes. Also, the high regards for the social aspects among students point to a good organization and a well-working school profile, with focus on the individual as well as the class as a whole, for both regular and model classes.

As an outlook, it must be mentioned that the school has now been successfully implementing this concept for its students for more than a decade. in the meantime, it is to be transferred from the school pilot status to the regular school system. The insight that could be gained on the basis of our evaluation can only welcome this endeavour.

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