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The Gift of Play: Scenario-Based Games for Nurturing Turkish Gifted Students' Challenged Minds and Emotions

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This study explores how game-based learning (GBL) describes observed changes in learning processes and developmental progress within a specific context for gifted students. It examines how scenario-based intelligence games contribute to cognitive, social, and emotional development by enhancing skills such as problem-solving, creativity, and collaboration. This action research originated from an effort to identify which skills should be supported and in what ways, such as through instructional strategies, collaborative activities, or play-based methods. Expert discussions emphasized the integration of play into teaching practices. The study was conducted with 20 formally identified gifted students aged 9–12 from a Science and Art Center in western Türkiye Data collection involved scenario-based games, observations, video recordings, and a rubric assessing eight domains (e.g., creativity, reasoning, ethics). Content analysis and triangulation were used for data interpretation. This qualitative research was structured in three consecutive phases: Phase 1, familiarization and traditional games, Phase 2, problem-solving with teacher-designed scenarios; and Phase 3, student-designed game projects. Key findings of the study include GBL's support for multidimensional development: cognitive (e.g., logic, creativity), social (e.g., collaboration, leadership), and emotional (e.g., self-confidence, empathy). Moreover, student reflections revealed increased engagement, ownership, and tolerance for criticism. Designing and evaluating games further enhanced critical thinking and team interaction. Across cycles, we observed higher engagement, more frequent collaborative problem-solving, and student-reported gains in confidence and empathy; rubric patterns suggested progress in creativity and reasoning. The teacher's role is pivotal in guiding this process. Therefore, integrating GBL into educational programs and teacher training is strongly recommended to support the holistic development of gifted learners.

Introduction

Historical records indicate that game plays were depicted in murals from Egypt's Middle Kingdom period, showing board games and children's hopping games (And, 1974). The Statue of a Child Playing with Walnuts from the Hellenistic Period, exhibited in the Vatican Museum (Open and Distance Education Faculty of Istanbul University, n.d.), further attests to the ancient

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origins of play. Indeed, archaeological findings extending back to prehistoric times reveal that play is a universal and enduring human behavior reflecting the evolutionary roots of cognitive play that underpin the development of human intelligence (Creekpaum, 2019).

Gifted children, in particular, may be more inclined toward experiential learning through play, especially when abstract concepts need to be concretized (SGDD-ASAM, 2024). For most children, games play a vital role in fostering healthy peer communication and supporting their social and emotional development (Vezirköprü Vocational School, 2024). However, some gifted students demonstrate asynchronous development. Due to differences in developmental stages of the talented, there is also a risk of being excluded by peers (Kula, 2019).

Despite some advantages of being gifted, the term asynchronous development is frequently observed in many talented children. This refers to uneven progress across cognitive, emotional, and social domains. For instance, a child who is advanced in cognitive skills compared to peers may be way behind in emotional or social development (Arslan & Dilci, 2018). As social beings, humans imitate sounds, behaviors, rules, and similar elements—especially during childhood, when such imitation frequently takes the form of real-life experiences through play. However, being gifted in specific domains does not necessarily mean excelling in all areas of development (Saranlı, 2017). In addition to asynchronous development, the "gifted" label itself can introduce psychological barriers—e.g., fear of failure, over-conformity, fear of social rejection, constant pressure to succeed, and heightened self-criticism. In this study, I explicitly acknowledge these risks and examine how they influence students' willingness to take intellectual risks, express creativity, and develop an authentic sense of self within Scenario-Based Learning (SBL) activities, which are realistic, narrative-driven tasks with defined roles, rules, and progressive challenges that require decision-making, collaboration, and reflection. Therefore I interpret patterns of hesitation, risk-avoidance, and perfectionistic self-monitoring not as disengagement but as label-linked affective constraints that the design must scaffold.

Conceptual Framework

Game-based learning (GBL) uses complete games (with goals, rules, and feedback) as the vehicle for learning objectives. *Gamification* adds discrete game elements (e.g., points, badges, challenges) to non-game tasks without making them full games. In this study, scenario-based games are defined as designed, rule-governed game tasks built around narrative scenarios that explicitly require problem-solving, logical/mathematical reasoning, creative ideation, ethical judgment, and collaboration, and that are iteratively revised based on player reflections. Game-based learning (GBL) is considered a powerful educational approach capable of addressing high levels of cognitive and emotional engagement (Chen et al., 2013; Siegle, 2015) and stimulating multiple dimensions of intelligence, such as fluid intelligence and creative problem-solving, which are essential for intelligence development. In GBL, interactive mechanics that capture students' attention are used to create deep learning experiences, which can be designed to target specific intelligence domains (Jackson & McNamara, 2013; Jin et al., 2020; Juric et al., 2021). Multiplayer games, on the other hand, are extremely important for developing cooperation and social interaction skills (Hainey et al., 2016; Medeiros Filho et al., 2024). The plurality of game players helps students gain a sense of belonging and work toward common goals, nurturing social intelligence and collaborative reasoning (Beavis et al., 2014; Kron et al., 2010). Moreover, GBL strategies strengthen students' problem-solving, analytical thinking, and adaptability, all of which are core components of high-order intelligence (Goldberg & Sottilare, 2016; Pöllänen & Vartiainen, 2011).

Research indicates that parents generally feel well and proud when their children are identified as gifted, assuming it is an outcome of enriched parenting practices (Headey et al., 2012; Olawa & Idemudia, 2019). Research characterizes gifted children as intellectually advanced (Vaivre-Douret, 2011), academically successful (Lohman, 2005), curious, creative, and high-ability problem-solvers reflecting high levels of both fluid and crystallized intelligence. Their self-awareness and environmental sensitivity (Lask, 1988) enable them to comprehend new concepts quickly, demonstrating advanced processing speed and working memory capacities linked to intelligence (Johnsen, 2021; Margrain & Farquhar; Markusic, 2019; Ünlü & Karadaş, 2023; Worrell et al., 2021). Yet, a closer examination of literature reveals a paradox. Despite the highlights on positive features (Fall & Nolan, 1993; Flynn & Shelton, 2022), many gifted individuals struggle to meet culturally idealized expectations and face many social challenges, which may reflect an imbalance between cognitive and emotional intelligence (Jovanovic & Vukić, 2018; Renati et al., 2016). Schmitz and Galbraith (1985) mention numerous difficulties, including low achievement, low self-concept, decision-making anxiety, social exclusion, narcissistic tendencies, and compulsive behaviors. Buescher (1987) asserts that an empathy deficit can impair mechanisms, leading many gifted children and adolescents to suffer or express their frustrations through maladaptive behaviors. These students, despite their academic strengths, often encounter significant challenges throughout their educational journey (Feuchter & Preckel, 2021; Neihart et al., 2016; Reis et al., 2021).

Contextual background

In Türkiye, out-of-school support for gifted individuals is primarily provided through Science and Art Centers (BİLSEM). Students who score 130 or above on national general ability tests undergo individual evaluation in these centers. Those identified as gifted are accepted into specially designed educational programs. This process begins with the referral of classroom teachers and includes a multiple-choice tablet-based exam, followed by interviews and skill-based assessments. Based on their performance, students are placed into different classes aligned with talents such as visual arts or music (MoNE, 2024). Studies conducted within BİLSEM have demonstrated that, instead of regular or traditional instructional methods, play-based learning is a more effective mode in the education of gifted children (Çankaya Counseling and Research Center, 2024). These centers incorporate multiple approaches, such as acceleration, grouping, and enrichment approaches, to design and implement programs that respond to individual student needs (Algı ABA Therapy and Child Development Center, 2024; Zhang et al., 2024).

Talent is often associated with high skill performance, whether it is innately predisposed or acquired later. In common usage, natural aptitude and a rapid learning capacity in a particular field are considered representative of the concept of talent. In Turkish culture, this group is typically referred to as high-ability children. In contrast, the English literature uses the term "gifted" to describe a person who possesses a natural or innate characteristic. Although this terminology may have been adopted to avoid direct reference to intelligence, and is perhaps more socially acceptable, its implications for children remain open to debate. As important as the choice of terminology, the issue of labelling is equally critical. Childhood represents the foundational stage of human identity. Therefore, how the labelling of children as gifted or talented shapes their childhood experiences, serving as a starting point for adulthood, should be carefully examined. In addition, although these children are often labeled as highly gifted, there is a notable gap in the literature regarding their needs and the role of games in addressing these needs. Hence, this study examines an underexplored domain of gifted education by shifting attention from *achievement-centric* narratives to the *psycho-social realities* of gifted learners. I conceptualize play as both an instructional tool and a learning objective via structured game design. At every stage of the research, goals were set in alignment with the needs of the children, as observed by the researcher or expressed by the children themselves, and the practices were carried out in accordance with the principles of action research.

Research Gap

Although game-based learning (GBL) has been widely studied in mainstream classrooms, many recent studies focus other aspects of giftedness. Existing studies rarely address the socio-emotional difficulties of gifted children such as anxiety, exclusion, or intolerance to criticism. In the Turkish context, despite the presence of BİLSEM enrichment programs, there is little empirical evidence on how scenario-based and student-designed games can foster both cognitive growth and socio-emotional development.

Research Problem

Gifted students exhibit advanced cognitive abilities but often struggle with socio-emotional challenges such as anxiety, social exclusion, and limited tolerance for criticism. Although game-based learning (GBL) has demonstrated effectiveness in enhancing engagement and higher-order thinking, most existing research emphasizes mainstream learners, digital platforms, or teacher-prepared games. There is a lack of studies investigating how *scenario-based, student-created* games can address both the cognitive and socio-emotional needs of gifted learners. In Türkiye, where BİLSEM centers provide specialized support, little evidence exists on how integrating structured play into enrichment programs may promote holistic development. This gap underscores the need for empirical research exploring the role of scenario-based GBL in nurturing both the minds and emotions of gifted students.

Research Purpose and Question

This action research investigates how game-based learning (GBL) operationalized here as scenario-based games characterized by explicit rules, roles, progressive challenges, collaboration, and narrative feedback supports gifted learners' problem-solving and higher-order thinking alongside their socio-emotional experiences. Rather than asserting causal effects, the study documents observed changes and student-reported meanings as gifted students with differing socio-emotional behavioral profiles engage with GBL across iterative cycles. Specifically, I examine how learners make sense of and respond to the integration of GBL with respect to *problem solving, creative cognition, and socio-emotional development*.

Core research question

How do gifted students with differing socio-emotional behavioral profiles make sense of and respond to the integration of game-based learning with respect to their problem solving, creative cognition, and socio-emotional experiences?

Sub-questions

(1) What cognitive strategies and insights do students report developing through participation in scenario-based GBL activities?
(2) How do students describe changes in creative thinking processes, including idea generation, flexibility, and originality across the GBL cycles?
(3) In what ways do learners perceive shifts in socio-emotional experiences (e.g., belonging/inclusion, empathy, self-regulation) while engaging in GBL?

(4) What design elements (e.g., collaborative tasks, narrative feedback, challenge scaffolding, role assignment/rules) do students identify as most influential for their learning and personal growth?

Method

Action Research Design and Cycles

This study adopts an action research design, which is one of the qualitative research methodologies. Action research is a method through which teachers aim to improve their own instructional practices and evaluate their contribution, including on students' profiles. The process involved continuous cycles of *observation, intervention, and evaluation* (Kemmis, McTaggart, & Nixon, 2014; Stringer, 2019). The study was structured in three phases as an action research project designed to support the development of students' problem-solving, collaboration, leadership, and creativity, and the development of multiple intelligences skills.

Table 1. Cycles of action research

Cycle	Plan	Act (scenario/mechanics)	Observe (data)	Reflect Changes Forward
1	Orientation, traditional games; co-plan with teachers	Ice-breakers & simple rules	Field notes, self-evaluations	Reduce public performance load; add framing on 'why games'
2	Teacher-designed scenarios	5 scenarios (roles, rules, challenges)	Observation and rubric	Increase student co-design; add debrief prompts on risk-taking
3	Student-designed scenarios	Student teams build/play/refine	Peer evaluations and products	Consolidate rules toolkit; plan teacher PD pointers

In this study, learning outcomes were examined through *problem-based gamified scenarios* that involved observing students' processes of developing independent narratives. The researcher, who took on the role of a participant observer, conducted the study across a fourteen-week educational period through three different roles: Designing and observing games (Phase 1), co-participating in game scenarios (Phase 2), and solely observing gameplay for reflection (Phase 3).

Learning and behavioral changes were recorded through video footage and field notes. At the end of each game, students evaluated themselves, their peers and provided suggestions for improvement. Action research is structured in a cyclical format, involving continuous cycles of planning, implementation, observation, and evaluation. This cyclical action research ensured iterative refinement of methods and a focus on intelligence development outcomes.

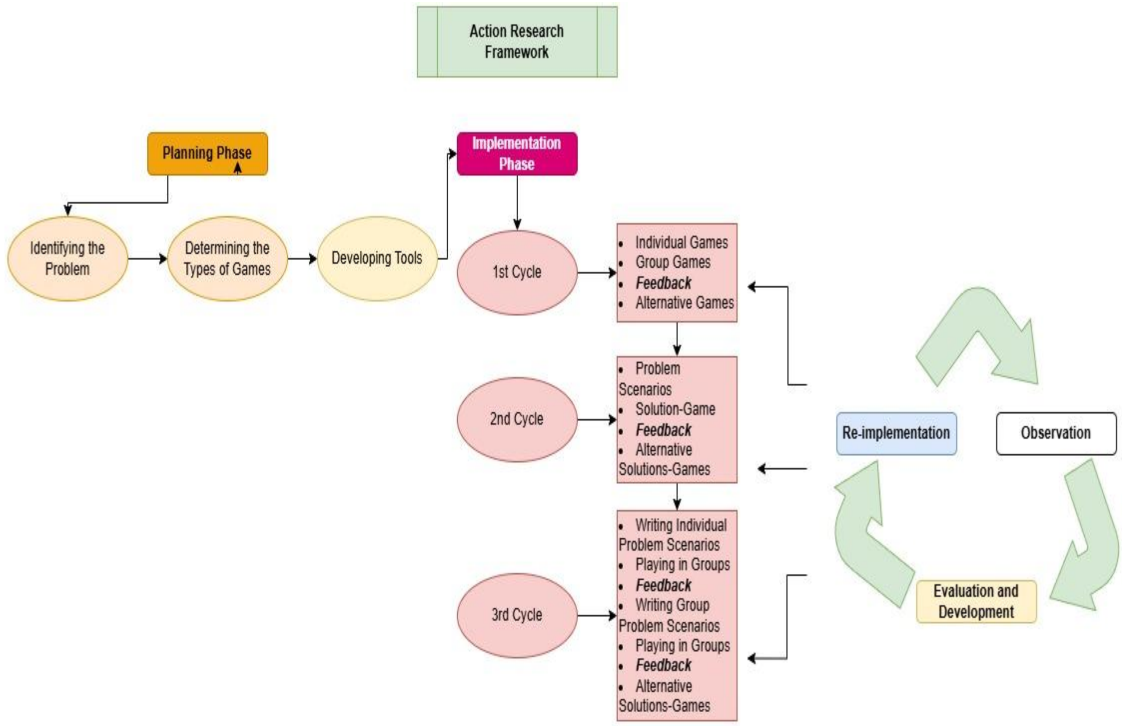

Figure 1. Research Design

Participants

The study was conducted with 20 students aged 9 to 12, all of whom had been formally identified as gifted and enrolled in one of the gifted centers in the western part of Türkiye. Among the participants, 12 were girls and 8 were boys. All participants demonstrated elevated IQ scores and were identified as gifted in the general ability domain, reflecting advanced cognitive intelligence. The sample was selected using purposive sampling among students who demonstrated advanced development in areas such as creative thinking, logical reasoning, and problem-solving, which are considered as key facets of intelligence. Although these children possess certain positive traits, it has been observed that some of them also exhibit challenges, commonly reported in the literature, such as social withdrawal, introversion, an excessive desire to demonstrate their strengths, dominant personality traits, and communication difficulties, factors that can affect both cognitive and emotional intelligence development, which could benefit from targeted intervention.

Data Collection Tools

The primary data collection tools used in this study are as follows:

Observation logs (pre-process)

As mentioned before, these children retain specific positive behaviors. However, social exclusion, introversion, overconfidence, dominant personality characteristics, and communication barriers, among others, challenge some of them. Students' own classroom teachers to determine whether BİLSEM-enrolled students exhibit any challenging socio-emotional behaviors that can affect both cognitive and emotional intelligence (see Appendix 1) used the observation log. After initial information provided by classroom teachers, observing those BİLSEM-enrolled students' progress continued throughout the research. Near the end of the semester, the researcher visited the classroom teachers in order to receive information if the research process created any difference in student behavior.

Rubric

A game-based learning rubric was used as the main data-gathering tool to systematically assess students' development, designed to observe students' problem-solving, creativity, independent thinking skills, and socio-emotional development. The rubric (see Appendix 2) was structured across four performance levels: *1: Inadequate, 2: Developing, 3: Proficient, 4: Exceptional,* across the following eight domains each reflecting distinct intelligence domains: Creative Thinking, Problem Solving, Product Design, Logical and Mathematical Thinking, Reasoning Skills, Scientific Thinking and Curiosity, Relationship Between Nature and Design, and Relationship Between Ethics and Science

Rubric Development and Validation

The game-based learning rubric was developed by researcher based on a review of existing GBL and gifted education assessment frameworks. Its eight domains were derived from both theoretical models of intelligence (e.g., creative, logical, socio-emotional) and expert consultations. To ensure content validity, the draft rubric was reviewed by three experts in gifted education and educational psychology, who provided feedback on clarity, domain coverage, and appropriateness of performance levels. Minor revisions were made accordingly. Reliability was addressed through pilot application with a small group of students prior to the main study, and inter-rater agreement was checked by having two independent raters score a sample of observations using the rubric. Agreement rates indicated acceptable reliability.

Data Analysis Process

The collected data were analyzed using qualitative data analysis methods. Students' behaviors during the game-based activities were scored using the rubric and then matched with the intended learning outcomes outlined in the achievement table (see Appendix 4). Using content analysis, students' behaviors and interactions during the games were thematically coded and interpreted. The coding process included determining each student's level of performance, particularly in intelligence-related domains and analyzing both individual and group development patterns. The resulting findings were compiled into an interpretive analysis report that provides detailed evaluations of the behaviors and learning outcomes observed in response to the gamified activities. Additionally, to enhance the study's validity and reliability, researcher cross-checked teacher observations, student-created products, and rubric data, resulting in a comprehensive profile of intelligence enhancement.

Research Design (RD) Phase 1: Familiarization and Integration

This phase involved observing student behaviors during structured games as a part of the familiarization and integration stage. Activities were designed and implemented to help this heterogeneous group of gifted students, with varying ages, abilities, and interests, get to know each other, adapt to the new environment, and identify their strengths and weaknesses, laying a foundation for assessing social and emotional intelligence alongside initial cognitive baselines. The first two weeks were focused on orientation and getting acquainted. During this period, a rubric and an observation log were prepared with the guidance of the school counselor and classroom teachers to evaluate the students' strengths, weaknesses, and areas for improvement. Based on the results of this assessment, it was determined that, despite individual differences, students generally needed to improve in areas such as tolerance for criticism, communication skills, and problem-solving abilities. The most appropriate instructional method to support these areas was explored. Following a focus group discussion with teachers and experts, it was concluded that incorporating play into instruction, particularly through problem-based, scenario-based, and game-based learning, would help alleviate the pressures associated with being gifted and enable students who receive formal education for longer periods than their peers to experience a healthier childhood.

After two weeks of introductory activities, students participated in traditional children games that were already familiar to them. The teacher teaches later games through direct instruction and demonstration. After each game, students evaluated themselves and the game, and replayed the game based on these reflections, encouraging metacognitive awareness and self-assessment of their intelligence application. During this phase, students primarily assumed the identity of game players.

RD Phase 2: Problem Solving Through Game Scenarios

In this phase, problem-solving scenarios were designed by the researcher, considering students' age, physical development, and talent differences. Scenarios were reviewed and approved by subject-matter experts before implementation. The scenarios, titled *"Establishing the XOXO Colony," "Finding the Lost City of YO," "Save the Pumpkin, Save the World," "Time Travelers," and "Make a Home for Grandson JO,"* were created to observe and enhance problem-solving, critical thinking, creativity, and leadership skills that are dimensions reflecting multiple intelligences frameworks. During gameplay, the participation of students with varying abilities was ensured under the teacher's guidance. The learning environment was also structured to allow every student to reveal their unique potential, fostering personalized intelligence development pathways. In this phase, students were also included in co-creating the narrative and began to take active and constructive roles in the learning process. Following each gameplay session, students evaluated, revised, and replayed the games, demonstrating iterative refinement of their cognitive strategies and creative intelligence. At this stage, students began to perform not only as game players but also as game makers, demonstrating creativity and ownership of the design process. This phase lasted for five weeks.

RD Phase 3: Game Creation and Project Development

This phase aimed to observe and enhance students' skills in independent thinking, decision-making, taking initiative, and creativity, thereby cultivating creative and practical intelligence. Unlike the previous phase, the teacher did not provide any pre-prepared scenarios. Instead, students were asked to create their own game scenarios based on a theme of their choice from the following list: Nature, Society, Individual, Cultures, or Future.

Students were instructed to identify a problem related to their chosen theme, develop a scenario to address it individually, play the game with their peers, and then evaluate its effectiveness. In the next step, students who had selected similar themes or designed comparable games observed if they formed small groups appropriately and worked collaboratively to develop a joint game scenario promoting social intelligence and demonstrated collaborative reasoning. In the following lessons, students who arrived with their plans, materials, and game scenarios played the games within their groups. These games were then evaluated by other students acting as observers. Based on the feedback received, students revised and replayed their games in a format that included the entire class, integrating reflective practice to deepen their understanding of cognitive intelligence. This process was repeated for each selected theme. In this final phase the purpose was to determine if students assumed a role beyond being a game player or game maker—whether they became game changers.

Results

Phase One: Introduction, ice breaking, and traditional games

When first exposed to the game-based activities, the majority of gifted students reported heightened anxiety and interpersonal pressure. In line with cognitive affective theories of challenge and threat, those without established leadership roles often experienced the public nature of the tasks as evaluative stressors. Typical student reflections included:

"It was uncomfortable having everyone look at me… I didn't want to do something wrong… if I act silly and they laugh, I feel embarrassed."

Yet, even within this discomfort, a paradoxical energizing effect emerged for some:

"I was already stressed and tired at the beginning, but the moment I heard we'd be playing, I suddenly became energized… I can do any task you give me, whether it's a game or science—will it be like this throughout the year?"

These dual reactions, anxiety coupled with renewed engagement, suggest that the novelty and perceived agency inherent in game-based approaches can simultaneously tax and motivate advanced learners (Malone & Lepper, 1987). Notably, only those students with preexisting "leader type" or "highly dominant personalities" reported minimal anxiety, indicating that self-efficacy and prior social confidence moderate affective responses to novel, public tasks. Following self-introductions, structured icebreaker games were employed to break down social barriers and encourage natural expression. Observation notes reveal that most students continued to exhibit caution—limiting risk-taking and preferring to wait for cues from peers—consistent with Vygotsky's (1978) concept of the Zone of Proximal Development, where learners remain tentative until a safe scaffold was provided. However, a small subset of overconfident participants seized the opportunity to performativity dominance:

"My name is (X), but you can also call me Crazy Horse—I might become an astronaut, but I don't want anyone to cry after me…I'd cry too if you all died when I came back."

By contrast, one student openly denied the pedagogical value of the games:

"You people don't know anything… What is this game? We will be scientists; we are wasting our time by playing… If I had known these ugly games, I would have gone to private school."

This polarizing behavior underscores how identity and beliefs about "seriousness" mediate engagement in playful learning and highlights the need for explicit framing of game-based tasks as genuine vehicles for cognitive and social development (Gee, 2003). When introduced to conventional children's games that were intended to spotlight attention regulation, social negotiation, and psychomotor coordination, students displayed both anxiety and boredom. Because these learners had little prior exposure to such culturally traditional play, initial rounds were marked by confusion and visible reluctance. Crucially, this phase yielded the highest rate of voluntary withdrawal from the sessions. Such early dropouts indicate that the simultaneous demands of unfamiliar rules and social evaluation exceeded participants' working-memory capacity which is a key component of social intelligence. The frequency of disengagement during this stage offers a practical indicator of how intrinsic load (task structure) and extraneous load (public performance) can undermine persistence, even among high-ability students.

Figure 2 summarizes the results of the first phase of the study:

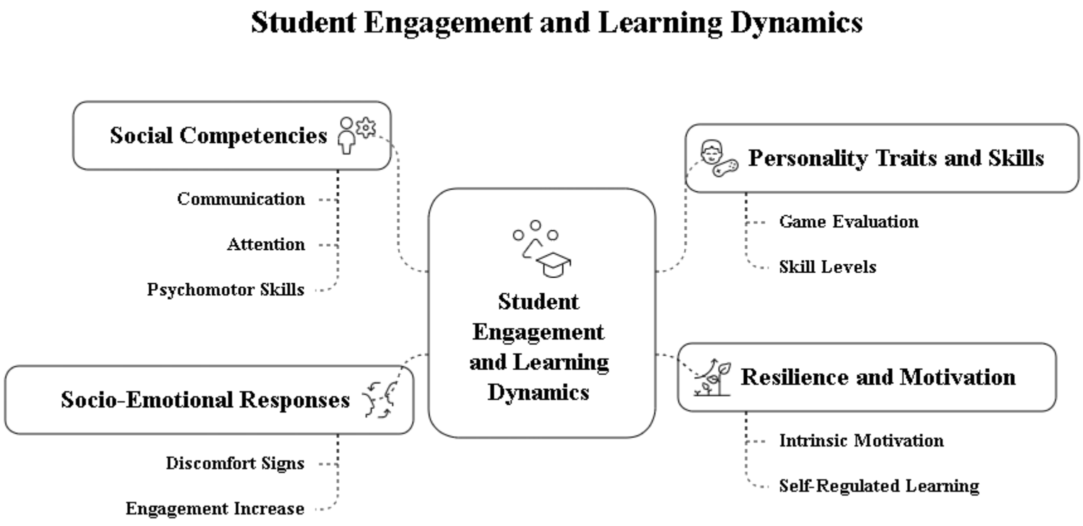

Figure 2. Dynamics of engagement and learning

Phase One illuminated a tension between motivational affordances and cognitive–affective barriers in introducing game-based learning to gifted students. Consistent with Cognitive Load Theory (Sweller, 2024), the simultaneous demands of novel rule sets (intrinsic load) and public performance (extraneous load) frequently overwhelmed learners' working memory capacity, resulting in marked hesitation, risk aversion, and increased voluntary withdrawal during traditional game activities. Yet, for some students, the same novelty and perceived autonomy triggered bursts of engagement—an effect well explained by Self Determination Theory's emphasis on autonomy and competence support (Ryan & Deci, 2022). These dual outcomes show that although well-designed educational games can bolster intrinsic motivation and cognitive resilience (Plass, Heidig, Hayward, Homer, & Um, 2020; Kapp, 2016), without graduated scaffolding, they risk inducing evaluative stress that dampens participation (Deterding et al., 2019). Importantly, only those with strong preexisting leadership self-efficacy navigated initial tasks comfortably, highlighting the moderating role of social confidence (Bandura, 2018). Therefore, to fully leverage the energizing potential of play for higher-order thinking and socio-emotional development, game-based interventions must employ an adaptive design—incrementally advancing task complexity and social exposure while providing explicit framing and support to transform early anxiety into sustained, self-regulated engagement. Taken together, these insights affirm that game-based approaches hold promise for energizing and challenging gifted students, but only when accompanied by intentional scaffolding (See Figure 3). Future phases of the study, therefore, introduced graduated task complexity, incremental social exposure, and explicit framing of play as a vehicle for higher-order thinking. By progressively adjusting both the cognitive demands and the socio-emotional supports, the aim was to transform initial anxiety into enduring engagement—thereby unlocking the full potential of games to foster problem-solving intelligence, creative cognition, and socio-emotional growth among gifted learners.

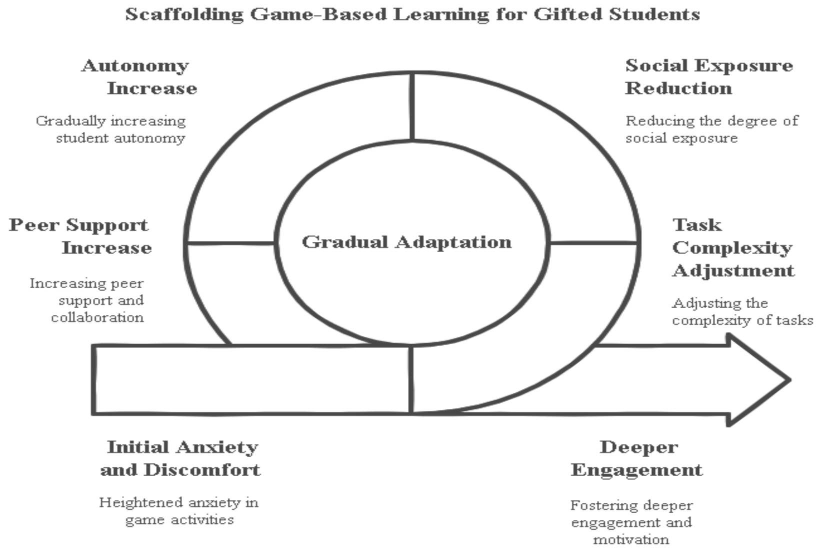

Figure 3. Adaptation process to games and peers

To sum up, during post-game evaluations, student comments included both critical and positive perspectives:

Table 2. Post-game evaluations

Critical:	"I couldn't run fast—I lost all the time." "It was a shouting game—very disturbing." "We kept doing the same thing—it was boring." "There was no logic to it—primitive, like for barbarians."
Positive:	"I burned off my energy—it was great." "I finally won—I think it was awesome." "High tempo is good—it keeps your mind sharp."

Students evaluated their personality traits and individual skill levels within the games. One striking detail was that not a single student, including those who disliked the game or did not want to participate, *accepted the option to take a break*. Moreover, in the following session, they returned in high spirits (even the one who sees the games as primitive human actions), bringing new game ideas to share with the group demonstrating resilience and intrinsic motivation, which correlate with self-regulated learning and academic intelligence.

Phase Two: Development of Cognitive and Social Skills through Scenario-Based Games

In order to support the development of creativity, problem-solving, collaboration, and leadership skills among gifted students through game-based instructional scenarios, five different scenarios were designed by predicting topics that would capture their interest during the initial acquaintance phase. These scenarios incorporated themes such as space, history, environmental awareness, and the future, each intended to activate distinct intelligence domains, from spatial intelligence to logical-mathematical reasoning, to spark curiosity and required students to solve a series of problems. Observations were conducted to identify instances in which students used collaboration, leadership, and creativity while solving in-game challenges.

Table 3. Games and roles

Games Developed by the Researcher	Duties and responsibilities in the game process
Establishing the XOXO Colony	In this game, students take on the role of a space exploration team tasked with establishing a settlement on a new planet. They are expected to develop strategic plans and use scientific methods, engaging scientific reasoning and fluid intelligence, to solve problems such as communicating with alien life forms, managing resources sent from Earth, and adapting to new living conditions. The game includes pre-placed riddles and challenges by the teacher that require mathematical calculations.
Discovering the Lost City of YO	Students play as researchers working on an archaeological excavation. The lead researchers, who had to leave due to an emergency, left behind a map that can only be deciphered through teamwork, as each puzzle contains information that only one student knows. Students are required to solve encrypted puzzles using mathematical logic, strengthening analytical and quantitative reasoning skills, and to collaborate effectively.
Save the Pumpkin, Save the World	The mission in this game is to find solutions to environmental crises threatening Earth. A mad scientist wandering in the forest provides the clue: "Save the pumpkin, save the world," and retreats to the lab, leaving the task to young researchers. Players follow the scientist's clues to develop strategic solutions. They are expected to take initiative, lead their teams, act collaboratively, and take responsibility as part of the group.
Time Travellers	The game begins with the discovery of a malfunctioning time machine. To repair it, they must collectively solve a complex problem. Once repaired, players travel to different historical periods within the game area, guided by clues. Each player is responsible for solving the problems of their assigned era, which emphasizes cultural analysis and linguistic research.
Make a Home for Grandson JO	In this game, students are tasked with building a home for their future grandchildren. They first collaborate to design a sustainable city, considering transportation, energy, natural resources, and ecological balance. Using materials such as wheels, wire, water, and soil found in the activity zones, they create a city model and individually design their homes. Students are asked to justify their design choices, based on their problem identification process.

During this phase, the researcher introduced scenarios, and lesson plans were implemented to foster skills such as problem identification, taking responsibility in problem-solving, adapting to collaborative work, and developing awareness of being part of a team and leadership, which enhanced students' metacognitive intelligence and self-regulation. Observations indicated increased motivation for research and improvements in students' metacognitive thinking skills, especially in planning, monitoring, and evaluating of their own learning.

At the end of this phase, student feedback included the following comments:

> …At first, I thought my idea was the best. I was upset when no one followed it, but what matters is the result […] To become a scientist, you don't need to be bored. I want to share this with my friends at school […] There were older students, but I solved the puzzles the fastest. That made me feel cool…I had fun and helped people. That's a great feeling…Once I start the game, I start finding flaws—thinking how I would've done it differently…Our life became an adventure. Researching with our team was wild and fun…When I get home, even while my mom is cooking, I start imagining new scenarios…Researching and discovering is so much fun. I don't get how non-scientists live…I wish we could learn through games at school, too.

Another student made comments on science:

> I used to consider science only with formulas, signs, and symbols, but then we started exploring real problems. Now I see stories everywhere. It's like I can't turn off my brain—even during dinner, I keep thinking! Solving challenges with my team made me feel like a detective [scientist]. We laughed, argued, and sometimes failed... but I wouldn't change that feeling for anything. Even after the game ended, I kept thinking: "What if we tried it this way?" I wish school were like that, a place where learning means discovering.

Figure 4 summarizes the phase in a visual format.

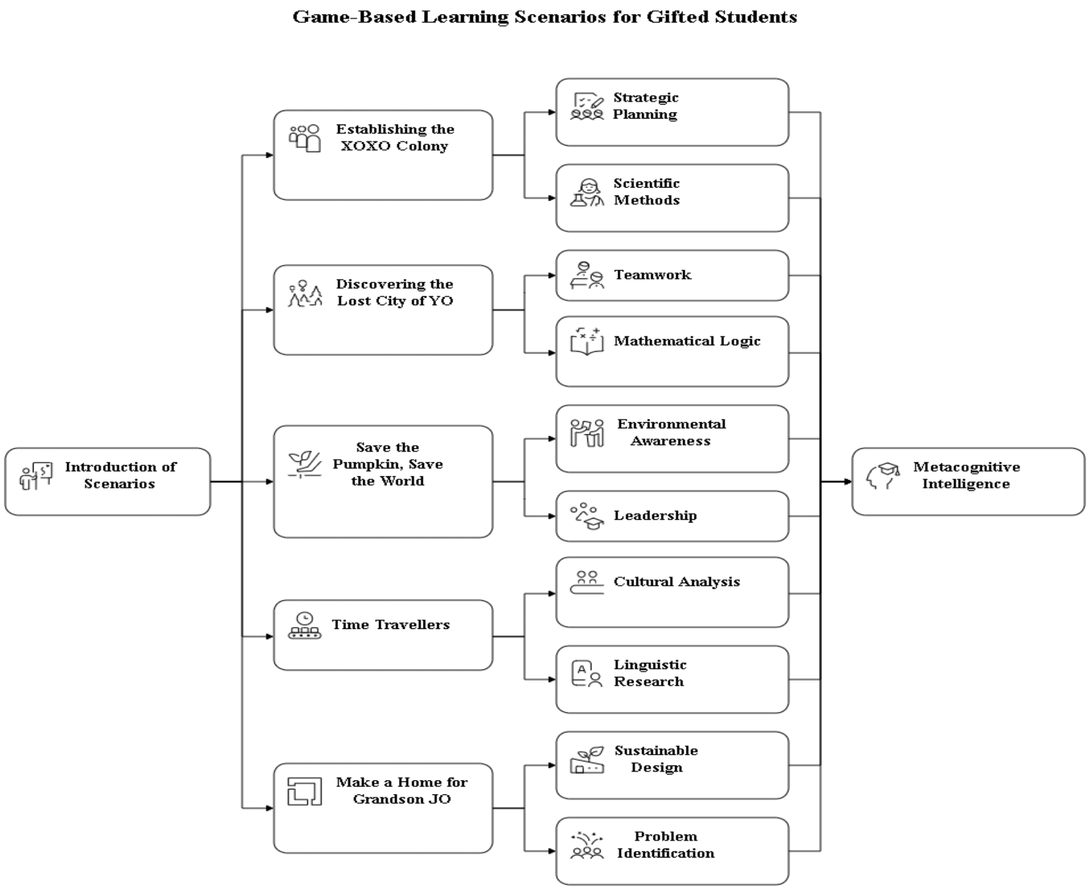

Figure 4. Games and areas of development

The second phase of our study demonstrates that carefully designed, scenario-based games can significantly enhance gifted students' cognitive and socio emotional competencies. Across five distinct thematic challenges—ranging from extraterrestrial settlement to sustainable urban design—students not only applied advanced problem-solving strategies but also exhibited marked growth in collaboration, leadership, and metacognitive regulation. Observation data showed that, as students navigated complex puzzles and intercultural simulations, they increasingly took ownership of their own learning: planning and monitoring their steps (Zimmerman, 2002), adapting strategies in real time (Sitzmann, 2011), and engaging in reflective evaluation of outcomes (Hmelo Silver, 2004).

Moreover, student reflections highlight a shift from viewing science as abstract formulas to treating it as a dynamic process of inquiry and discovery—a transformation consistent with Papastergiou's (2009) findings on the motivational power of game-based learning in STEM contexts. The emergent enthusiasm— "I start imagining new scenarios… I don't get how non-scientists live"—underscores Gee's (2003) argument that well-crafted games can foster deep engagement by embedding learning within meaningful contexts. Importantly, the development of higher-order thinking was accompanied by socio-emotional gains: students reported increased confidence in sharing ideas, resilience in the face of failure, and a genuine desire for peer collaboration, echoing Clarke Midura and Dede's (2010) demonstration of games as powerful vehicles for both cognitive and social growth.

Together, these outcomes suggest that scenario-based game interventions, when aligned with clear learning objectives and supported by scaffolding, can transform traditional lesson formats into vibrant arenas for self-regulated learning, creativity, and collective problem-solving. Future research should examine longitudinal influences on academic achievement and investigate how variations in game complexity and group composition further mediate these benefits.

Phase Three: Student-Designed Game Scenarios and Projects

In the final phase of the study, students were encouraged to *design* their own game scenarios based on five thematic categories. These themes—Nature, Society, Individual, Cultures, and Future—driving creativity and ownership that are key components of creative intelligence, were derived from the interests observed in students during the previous phase. Students were allowed to choose one or more of the proposed themes, combine them, or even introduce new self-defined themes to create their individual scenarios.

To observe students' independent decision-making and initiative during this phase, the teacher as the researcher intervened only when absolutely necessary. Initially, students were expected to construct their scenarios individually, and it was observed that all students enthusiastically engaged in designing their own games. They collaboratively decided the order in which the games would be played and approached this as a problem to solve, discussing and displaying their decisions on a classroom board. While some students focused on themes of Nature and Future, others proposed additional themes such as Nature and Technology, Universal Life, Negative Science, and War and Peace, demonstrating their emerging capacity to define complex problems and demonstrate transferable intelligence skills.

Table 4. Students' game designs

Student-Developed Games	Contents
Future-Themed Games	Set in a future where humans have abandoned speech for telepathy, a time traveller from the past faces communication challenges. A digital tournament of the 29th century is disrupted by a global power outage. Students role-play as researchers tasked with identifying and solving the issue.
Nature-Themed Game	The Earth's northern and southern hemispheres have swapped due to an astronomical event, causing mass extinction. Students work to develop a plan for restoring Earth's habitability.
Nature and Technology-Themed Game	A billionaire organizes design competitions for disaster-resistant homes due to increasingly frequent natural disasters. Students became so inspired by the design concept that they initiated a project competition based on their game—an indicator of developing entrepreneurial behaviour.
Universal Life-Themed Games	Scientists have discovered the secret to immortality, but the formula mysteriously disappears. Students collaboratively created and played out alternative scenarios to recover or respond to the lost formula.

War and Peace-Themed Game	The scenario began with a challenge: mark the largest territory in one minute using boundary stones to score points. This quickly led to conflicts. One student climbed a fig tree and claimed only that space, avoiding disputes. Later, the game master introduced hidden resource zones (gold, copper, iron), triggering new dynamics. Students began trading land and forming alliances or acting independently.

Students who authored the scenarios exhibited strong leadership during group discussions, which was notably recognized and appreciated by peers. This outcome suggests a shift in gifted students' initial tendency to resist criticism and seek constant praise. For instance, in a game universe where all life forms have evolved to survive anywhere in the cosmos and understand all languages, students represented unique life forms. These forms faced extinction if they could not find a suitable planet. Students randomly selected three planetary condition cards and were tasked with explaining how their life forms would adapt evolutionarily. One student, opting to work alone, devised a highly creative solution—sending out clones to multiple planets and analyzing death reports to determine environmental challenges and adaptation strategies. While innovative, the solution led to a post-game ethical debate on scientific ethics, prompting students to propose alternative ideas. Disagreements escalated to the point that students collectively decided to convince a council and create new rules. While this collaborative world-building was appreciated, the session highlighted the importance of planning and process management due to frequent noise and confusion.

Across these group-designed games, students demonstrated high levels of creativity both in writing scenarios and in identifying core problems. They actively and constructively participated in both problem-solving and evaluation phases of games designed by their peers. Younger students generally showed higher levels of creative thinking, while older students excelled in organizing, sequencing, and resolving in-game challenges, suggesting that age and experience contributed to the intellectual development of social and cognitive skills among the gifted group.

Students' sample reflections about the 3rd. phase are as follows:

> I was amazed by my own scenario. Everyone I shared it with loved it. I never knew I could think of these ideas… (Student 4) I had more fun with the games you ran. While playing other students' games, things got a bit chaotic…(Student 7) Mine was the most liked, though I think others had more creative ideas…They found a better problem in my game than I had imagined—maybe that's the beauty of our teamwork…(Student 11) At first, I hated not being liked, but after these games, I got used to not always being the favorite (Student 9).

The final phase of the study provides compelling evidence that cognitively and socio-emotionally rich learning processes can occur when students are given the autonomy to design their own learning environments—particularly through game-based scenarios. As students independently conceptualized game narratives based on themes such as nature, technology, society, and futurism, they engaged in advanced cognitive activities including abstract thinking, complex problem formulation, systematic thinking, and speculative reasoning. These skills, often associated with higher-order thinking processes (Anderson & Krathwohl, 2001), were not elicited through direct instruction but emerged organically through student-driven exploration.

These shifts reflect key indicators of socio-emotional maturity, such as self-awareness, empathy, and social responsibility (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2020). Notably, the game development process appeared to foster what Vygotsky (1978) described as the internalization of social processes into individual competencies. For instance, when students confronted ethical questions in a post-game discussion—such as the use of cloning or conflict over territory—they demonstrated a capacity for perspective-taking and moral reasoning, suggesting that the cognitive challenges of designing and navigating game worlds served as a medium for identity development and value clarification. Age-related trends were also observed. Younger students tended to demonstrate more divergent and imaginative thinking, while older students excelled in organizing game sequences, managing tasks, and leading collaborative discussions, supporting research on developmental trajectories of executive functions (Diamond, 2013; Trilling & Fadel, 2009).

In conclusion, this phase confirms that when gifted students are empowered to design their own learning scenarios, cognitive and socio-emotional development can progress in parallel, dynamically reinforcing one another. The interplay between imagination, collaboration, and ethical reflection within student-generated games demonstrates that learning environments anchored in creativity and agency not only enhance intellectual development but also cultivate socially and emotionally grounded individuals.

Discussion and Conclusion

This study aimed to describe observed changes during a game-based learning approach on gifted students. The results indicate that game-based scenarios related to the intelligence of gifted contribute multidimensionality to students' cognitive, social, and emotional development (Moral Pérez et al., 2018; Pratama & Setyaningrum, 2018; Zainuddin, 2024). These contributions include enhancing critical thinking skills—central to analytical intelligence—, improving collaborative and communicative skills (Hava et al., 2020), and fostering emotional intelligence (Untari, 2022) among students. Throughout the gameplay process, students actively utilized and visibly improved their creative thinking, problem-solving, and collaboration skills. This suggests that game-based learning not only promotes academic success but also strengthens individuals' social and emotional capacities (El-Said & Mansour, 2008; Hilliard & Kargbo, 2017; Zainuddin, 2024). Notably, the process of designing their own scenarios led to substantial growth in students' entrepreneurship, leadership, and project development skills —reflecting practical and strategic intelligence. By increasing their self-confidence, the process encouraged students to express and implement their own ideas, forming a crucial foundation for their future careers.

As is typical of action research, the flexible structure of the study allowed for a learning environment responsive to students' needs, enabling them to learn through direct experience—engaging experiential intelligence and metacognitive awareness. In this context, the role of the teacher is crucial; by guiding and supporting learners, teachers help maximize the benefits of game-based experiences. Such a learning approach contributes not only to academic success but also to the development of essential life skills (Hilliard & Kargbo, 2017; Wardoyo et al., 2020), empowering students to become more well-rounded and adaptable individuals. It also supports students in developing teamwork and communication skills by strengthening their social competencies, allowing them to participate more effectively in group work—key aspects of interpersonal intelligence, allowing them to participate more effectively in group work (Fortepiani, 2023).

Although it was initially planned that students would assume the roles of game players in the *first phase, game makers in the second, and game changers in the third*, in practice, students exhibited varying player identities in each phase. For example, in the second phase, students were expected to contribute to solving or facilitating structured games; however, several introduced entirely new ideas and transformed the original scenarios, demonstrating gamechanger behavior related to creative intelligence and divergent thinking. Interestingly, these same students sometimes struggled with attention and anxiety when managing their own scenarios in the third phase, despite having established high expectations among their peers. The practice of evaluating and replaying each game not only supported attention and creativity (El-Said & Mansour, 2008) but also helped students develop tolerance for criticism (Bhat et al., 2023) and encouraged them to use strategies such as seeking help in collaborative problem-solving efforts (Nordby, 2016; Wardoyo et al., 2020), highlighting the interplay between emotional regulation and cognitive intelligence.

Affective competencies such as accepting social roles, cultivating active citizenship, and demonstrating resilience in the face of criticism, which were observed during the study, are also traits that can be developed through play. The findings of this research highlight the effectiveness of play in learning, positioning it as both an educational and developmental tool for gifted students (Galarneau, 2007). Scenario-based gameplay and problem-solving activities supported the development of students' individual and social skills (Fonseca et al., 2012; Frossard, 2013). As an alternative to traditional instructional methods, learning through play appears to be a powerful approach, especially in fostering creativity, curiosity, and entrepreneurial thinking. In this context, the use of game-based learning scenarios should be actively encouraged in educational settings, and this approach should be integrated into teacher education curricula would be a recommendation for educators (Asbell-Clarke et al., 2020; Mathrani et al., 2016).

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Conflict of Interest

Single author, not applicable.

Informed Consent:

All relevant ethical principles were meticulously followed throughout the preparation and implementation of this research. This study, including data collection, analysis, and interpretation, was conducted in strict adherence to established ethical standards, with particular attention given to minimizing potential risks to participants. Informed consent letters were obtained from both parents and students. Before the semester and the study commenced, participants were provided with a comprehensive explanation of the study's content. This study was conducted in full integration with our institution's educational processes and complies with the research and development principles set forth in Article 39 of the Directive on Science and Art Centers.

Abbreviations

The following abbreviations are used in this manuscript:

GBL	Game-Based Learning
BİLSEM	Science and Art Centers in Türkiye
TDK	Turkish Language Association
MoNE	Ministry of National Education

STEM	Science Technology Engineering Math
RD	Research Design

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Appendices

1. Observation log*
Student Name:
Number:

	Observed Specification	1 – Not observed	2 - Low	3 - Moderate	4 - High	Point
1	Expressing oneself in new settings	Completely withdrawn, does not speak	Communicates only with a trusted person	Gradually adapts to the environment, communicates	Quickly adapts to the environment, expresses oneself comfortably	
2	Interaction with peers	Avoids peers, prefers to stay alone	Engages in interaction only when guided	Occasionally communicates with peers	Actively communicates with friends	
3	Participation in group work	Refuses to participate	Shows reluctance to participate	Participates when assigned a task	Voluntarily takes on tasks and helps lead the process	
4	Expression of emotions	Does not express emotions, has a blank face	Mostly passive and reserved	Expresses emotions when necessary	Uses open, appropriate, and balanced emotional expressions	
5	Willingness to communicate verbally	Avoids speaking	Gives short answers only when asked	Joins conversations but sometimes withdraws	Spontaneously participates in conversations, shares ideas	
6	Displaying self-confident behaviour	Avoids taking responsibility, fears mistakes	Shows low-level participation, easily discouraged	Shows confidence with external support	Makes own decisions, expresses opinions without hesitation	
7	Displaying leadership behaviours	Never takes initiative	Accepts leadership if offered	Takes initiative in some activities	Naturally assumes a leadership role in activities	

8	Openness to criticism and feedback	Avoids criticism, negatively affected	May become defensive when receiving feedback	Accepts feedback and adapts	Sees criticism as an opportunity for growth

***Translated from its original version** **Score**

2. Rubric

Student Name:

Assessment Area	Level 1: Inadequate	Level 2: Developing	Level 3: Proficient	Level 4: Excellent
Creative Thinking	Has difficulty generating ideas; repeats existing ones.	Produces a limited number of ordinary ideas.	Develops a variety of applicable ideas.	Presents extraordinary, original, and inspiring ideas.
Problem Solving	Struggles to define the problem; produces no solutions.	Defines the problem but provides insufficient solutions.	Develops applicable solution proposals.	Generates versatile, creative, and effective solutions.
Product Design	Does not develop a product or follow instructions.	Develops a product according to instructions but lacks originality.	Creates a product that is original and related to learning outcomes.	Develops a highly original product offering a different perspective.
Logical and Mathematical Thinking	Cannot develop strategies; struggles to establish relationships.	Tries simple strategies; has deficiencies in reasoning.	Develops appropriate strategies to solve problems.	Develops and explains effective strategies for complex problems.
Reasoning Skills	Cannot use inductive/deductive methods.	Attempts reasoning but is limited.	Makes logical inferences and provides examples.	Effectively uses various reasoning methods and builds connections.
Scientific Thinking and Curiosity	Does not observe or ask questions.	Observes but questions are superficial.	Asks in-depth questions and makes observations.	Demonstrates high-level scientific curiosity and a questioning attitude.
Nature and Design Relationship	Cannot establish the connection between nature and design.	Expresses nature-design relationships with simple examples.	Relates concepts with examples from the environment.	Develops nature-based, original designs and analyzes their impact.
Ethics and Science Relationship	Cannot define the responsibilities of scientists.	Provides examples of ethics, but with weak connections.	Explains ethical examples relevant to scientific processes.	Analyzes the social and ethical impacts of scientific work in depth.

Score