Integrating AI and Big Five Personality Profiling in Curriculum Design: A Case-Based Learning Approach in Teacher Education

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Article

Integrating AI and Big Five Personality Profiling in Curriculum Design: A Case-Based Learning Approach in Teacher Education

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Abstract

This paper presents the design and implementation of an AI-supported curriculum innovation that integrates personality assessment with case-based learning to foster student agency and reflective competence in teacher education. Drawing on the Big Five personality model, the intervention aims to strengthen students' professional self-awareness and their ability to navigate emotionally and socially complex situations with greater autonomy. The curricular design introduces a web-based system that generates individualized learning materials based on students' personality profiles, combining standardized feedback with tailored case scenarios grounded in real practicum experiences. The intervention was piloted in physical education teacher education programs at the Norwegian School of Sport Sciences. Pre-service teacher students first completed a validated Big Five inventory and received a personalized report. Reports included trait-based interpretation and static case descriptions adapted to each student's personality profile. The cases were thematically structured around common practicum challenges identified through peer interviews and reflexive thematic analysis. Implemented through a blend of individual preparation and group-based reflection, the intervention promoted high engagement, perceived relevance, and opportunities for agentic decision-making. Students described the cases as realistic, emotionally resonant, and personally meaningful. While no formal outcome measures were collected, feedback indicated enhanced metacognitive insight, peer dialogue, and perceived professional preparedness. This article offers a transferable model of curriculum design that leverages psychological profiling and AI-supported personalization to support student agency, bridge theory and practice, and foster reflective, context-sensitive learning in professional education.

Keywords: personalized learning; Big Five; case-based learning; teacher education; reflective practice; AI in education; curriculum innovation; professional self-awareness

1. Introduction

Higher education faces increasing demands to address student diversity in learning preferences, engagement, and professional readiness. In teacher education and health-related professional programs, the ability to reflect on one's own behavioral tendencies is particularly important, as interpersonal and emotionally demanding situations are an integral part of the professional role. In this context, fostering **student agency,** understood as learners' capacity to make intentional choices, reflect critically, and take ownership of their development, is essential for preparing future teachers to navigate complex professional environments. Agency is particularly important in professions that require adaptive expertise, interpersonal sensitivity, and autonomous decision-making [1]. Prior research has shown that personality traits are closely linked to teachers' instructional quality and

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relationships with students [2-4], and to burnout, conflict management, and well-being among health professionals [5-7].

Yet, traditional teaching practices in higher education rarely provide opportunities for students to exercise agency over their own learning processes [8]. Generic instructional cases offer limited space for students to connect their individual dispositions to the challenges of professional practice, thereby constraining opportunities for **agentic engagement,** self-directed reflection, and development of context-sensitive strategies. While case-based learning is widely used to bridge theory and practice [9, 10], most cases are generic and do not reflect students' individual strengths, vulnerabilities, or learning styles. This paper presents the development of an innovative educational design that combines personality assessment based on the Big Five model with case-based learning. The aim is to provide students with simulated scenarios that are tailored to their personality traits, thereby promoting deeper reflection and more personalized strategies for managing complex interpersonal situations. As Korthagen [11] points out, teacher education has long struggled to create meaningful connections between theory and practice. The case model presented in this paper seeks to address this gap by grounding theoretical exploration in students' own experiences and fostering reflective, context-sensitive learning.

The initiative draws on research indicating that increased awareness of one's personality traits can enhance self-regulation and adaptive behavior in demanding contexts [12, 13]. Grounded in these insights, we developed a prototype for a web-based learning tool that generates tailored case descriptions based on students' responses to a Big Five personality inventory. By integrating artificial intelligence (AI), the tool aims to support scalable personalization of learning content in a pedagogically meaningful way. The intervention described in this paper also aims to strengthen student agency by tailoring case-based learning to each student's personality profile. By enabling students to explore professional dilemmas through the lens of their own traits and tendencies, the design empowers them to take greater ownership of their learning, reflect on personal–professional dynamics, and develop context-sensitive strategies for action. In doing so, the intervention offers a replicable model of personality-informed teaching that supports both reflective competence and agentic engagement, contributing to ongoing SoTL-based innovations in higher education.

2. Theoretical and Pedagogical Framework

The intervention described in this article is grounded in two complementary frameworks: the Big Five personality model and pedagogical principles of differentiated, case-based learning. Together, these frameworks support the design of learning experiences that are both personalized and professionally relevant.

2.1. The Big Five Personality Model in Education

The Big Five model conceptualizes personality across five broad domains; Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, and thirty underlying facets [14]. In the context of professional education, personality traits shape how students perceive and respond to social and emotional demands. For example, research has shown that teacher personality traits are associated with student motivation, classroom dynamics, and even student achievement [4, 15]. In health professions, traits such as emotional stability and agreeableness are linked to psychological resilience and interpersonal functioning [5, 7]. Personality also influences students' readiness for practice. Many student teachers report "practice shock" when encountering emotionally charged or unpredictable classroom situations for the first time [11, 16, 17]. Similarly, students in nursing and social care programs face challenges when interacting with difficult patients, families, or team members [18, 19]. Enhancing students' awareness of their own personality profiles may help them anticipate and manage these situations more effectively. Awareness of one's personality may also enhance student agency by enabling learners to better understand how their dispositions influence decision-making and interpersonal behavior. When students reflect on these patterns, they may be more likely to approach professional challenges with intentionality and autonomy.

2.2. Differentiated and Case-Based Learning

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Differentiated instruction aims to meet individual student needs by varying content, process, or product based on student characteristics [20]. While widely practiced in primary and secondary education, differentiated learning designs are less common in higher education, particularly in large-group instruction. By integrating personality profiles into the design of case-based exercises, the present intervention introduces a scalable model of differentiation that targets professional self-awareness and decision-making. Case-based learning engages students in the analysis of realistic, often complex scenarios that require interpretation, perspective-taking, and applied knowledge [9, 10]. It supports both content learning and the development of critical thinking, empathy, and interpersonal skills, core competencies in professions such as teaching and healthcare. By tailoring case narratives to individual profiles, of the students, the current approach seeks to strengthen the connection between the personal dispositions and the professional dilemmas presented. This theoretical and pedagogical foundation informs the development of an innovative tool that not only customizes learning materials to the individual but also addresses the deeper question of how personality awareness can be meaningfully integrated into professional education. The intervention may facilitate agentic engagement by aligning case content with student´s self-perceptions and encouraging them to assume active responsibility for how they respond to professional dilemmas [21].

3. From Case Design to Classroom Practice: A Model for Enhancing Student Agency

The intervention piloted in this study centered on static, personality-tailored case descriptions. That is short, text-based scenarios designed to reflect emotionally or socially challenging classroom situations commonly encountered by beginning teachers. While the broader project includes future plans for dynamic, AI-driven simulations, the initial phase prioritized static content to ensure pedagogical coherence, technical feasibility, and meaningful student feedback.

3.1. Integrating Personality, Practice, and Theory

The pedagogical model was scaffolded through a two-step instructional process. First, students completed a validated Big Five personality inventory and received a personalized report detailing their scores across five domains and thirty facets. These reports combined standardized scores with explanatory texts offering individual reflections, such as how low Assertiveness might influence classroom management or how high Emotional Volatility might affect stress regulation. These insights were not intended to categorize students but to stimulate metacognitive awareness of their personal strengths and challenges in professional contexts. Second, students participated in a structured peer-interview activity, where they reflected on emotionally or practically demanding situations from their practicum placements. These interviews, submitted via the web survey platform and analyzed using reflexive thematic analysis, uncovered recurring themes such as classroom authority, emotional regulation, ambiguous professional roles, and mismatched expectations. These themes formed the backbone of the case library. Each student received a static case scenario adapted to their personality profile, situated within one of these common practicum challenges.

To support student agency, the intervention was designed to integrate three key pedagogical dimensions: theoretical knowledge, lived practicum experience, and individual psychological disposition. The overarching ambition was to weave these elements together to enable students to make sense of classroom challenges in personally meaningful ways, and to act with autonomy and intentionality in their future professional roles.

3.2. Implementation Across Courses

The case-based sessions were implemented across multiple teacher education courses at the Norwegian School of Sport Sciences during the 2024–2025 academic year. Sessions were typically structured as double periods. Each began with a short theoretical lecture delivered by the instructor, presenting key concepts relevant to the upcoming case work. For example, one session introduced theories of children's self-regulation, highlighting the role of executive functions, emotional control, and co-regulation in school contexts. Following the lecture, students reviewed their personalized case

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and reflected individually on how their own personality traits might influence their interpretation of the scenario, particularly in relation to the theoretical perspectives just presented.

In the second half of the session, students worked in small groups to discuss their cases. These discussions focused not only on problem-solving but also on how different personality dispositions shape professional perceptions, and how theoretical knowledge can inform their responses. For instance, a student with a case involving a disruptive child might, based on the self-regulation theory from the lecture, reinterpret the behavior as a sign of underdeveloped executive control rather than defiance. If the student scored high in Orderliness and low in Flexibility, they might reflect on how their own preference for structure could affect how they respond—and how they could adapt their approach using co-regulation strategies. This process reflects agentic engagement by prompting students to actively connect theoretical knowledge with their own dispositions and professional experiences, which in turn may allow them to make more informed and deliberate choices in how they interpret and respond to classroom situations.

3.3. Student Engagement and Pedagogical Observations

The activity concluded with a structured reflection phase, where students submitted individual and group reflections via the web survey platform. These responses were later used for course development and qualitative evaluation. Informal feedback and reflection notes suggested strong student engagement. Many described the cases as "strikingly relevant," "close to real life," and "useful for thinking about how I react in the classroom." The teaching team observed that the intervention supported key competencies emphasized in the curriculum: professional self-awareness, reflective practice, and classroom management. Moreover, the design appeared to create a psychologically safe space for open peer dialogue around personal challenges. Group discussions enriched the learning experience by surfacing diverse interpretations of similar challenges, promoting tolerance for ambiguity and alternative perspectives—core components of agency in professional learning.

While no formal outcome measures were collected in this phase, we believe that the intervention showed strong face validity. Based on these insights, future iterations will incorporate structured evaluation and explore dynamic case formats, including chatbot-based simulations. The positive reception and pedagogical potential of this model suggest that personality-tailored case work can meaningfully support student agency by enabling learners to link theory, self-knowledge, and practical reasoning in context-sensitive ways.

4. Technical Implementation and Personality Reporting

The technical infrastructure for generating personality-tailored learning cases was developed using R and R Markdown, allowing for scalable, semi-automated production of individualized student reports and learning materials. Students were invited to complete a 300-item Big Five personality inventory via Nettskjema.no, a secure digital data collection platform. Responses were exported as an Excel file and processed in R using a custom script.

The scoring process began with data cleaning and the computation of raw scores for each of the 30 lower-order facets associated with the five broad Big Five domains: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. These raw scores were then standardized using Z-scores based on a Norwegian norm database of approximately 4,000 respondents. For robustness against skewed distributions, Z-scores were calculated using the median and median absolute deviation (MAD) rather than mean and standard deviation. The Z-scores were then transformed into Stanine scores (on a 1–9 scale), allowing for clear categorical interpretation of each trait in relation to population norms.

Once personality scores were computed, an R Markdown template was used to generate individualized PDF reports. Each report included the student's Stanine scores across the 30 facets, accompanied by interpretative text explaining the implications of high or low scores on relevant traits. For example, a high score on Emotional Volatility might include a prompt to consider stress regulation strategies, while low Assertiveness could trigger a discussion of boundary-setting and classroom authority. These interpretive texts were generated via an API to OpenAI GPT-4o model

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using carefully designed prompts that transformed trait profiles into professional development feedback.

The reports also included a tailored static case description written to reflect the student's personality profile and likely professional challenges. Prompts submitted to GPT-4o included anonymized trait profiles and context-specific triggers, such as "generate a realistic classroom dilemma that challenges a teacher high in Orderliness and low in Flexibility." The resulting case narratives were pedagogically structured, describing a scenario, a disruption or dilemma, and open-ended reflection questions. No personally identifying data were transmitted to external APIs, and all prompts were restricted to anonymized Stanine profiles, ensuring compliance with GDPR and Norwegian ethical standards.

5. Insights and Reflections from Implementation

Although no formal research ethics approval or informed consent was collected for the purpose of publishing student data, the implementation of the intervention yielded valuable pedagogical insights through continuous observation, student discussions, and anonymous evaluation responses collected as part of regular course feedback. The reflections presented here should be understood as the author's synthesis of practice-based experience and patterns observed across student engagement, rather than generalizable findings. Overall, the integration of personality-tailored case work appeared to foster meaningful engagement. During group sessions and plenary discussions, students repeatedly described the experience as relevant, thought-provoking, and emotionally engaging. A recurring theme across verbal and written feedback was that the tailored nature of the cases helped make the scenarios feel "personal," "realistic," and "directly connected to my future role as a teacher."

In the anonymous evaluation forms distributed after the course module, students were asked to indicate how they felt in response to the case work using a simple emotion word. The most frequently chosen descriptors were "educational", "engaged", and "curious", suggesting that students were cognitively and emotionally invested in the learning process. Far fewer students reported negative or disengaged responses such as "frustrated", "overwhelmed", or "indifferent", which may indicate that the cases struck an appropriate balance between challenge and accessibility. Further, students were asked to reflect on the personal relevance of their case. A large majority agreed or strongly agreed that the case felt relevant to them as student teachers, and that the personalized aspect made it more meaningful. Many also indicated that the case challenged them in a useful way and stimulated reflection on their own strengths and limitations. Responses to Likert-type items showed positive skewness on all items, particularly regarding perceived meaningfulness and emotional engagement.

Students also responded positively to group discussions, noting that hearing how peers with different personality profiles interpreted and responded to similar scenarios enriched their own understanding. This dialogic reflection seemed to enhance metacognitive awareness, particularly around how personality traits may influence teaching style, communication, and conflict management. Several students commented that group diversity and open-ended discussion made them more aware of the plurality of possible responses to classroom challenges. Some students did express uncertainty about the link between their personality scores and the case they received. A few were unsure whether the case matched their self-image, or whether they might have learned more from a case targeting different traits. This suggests that further transparency in how case profiles are generated, and perhaps offering a second case based on contrasting traits, could support deeper learning. Others requested more explicit integration between lecture content and case topics, such as better alignment with concurrent sessions on children´s self-regulation development and classroom behavior.

The activity also prompted constructive suggestions for improvement, including better group composition (grouping students with diverse personalities), clearer instructions, and offering physical in-person sessions to deepen peer engagement. These suggestions have been taken into consideration in the planned next iteration of the intervention. Taken together, these observations suggest that personality-tailored case work can serve as a powerful pedagogical tool. By making

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professional challenges feel personally relevant and emotionally resonant, it appears to increase motivation for self-reflection, foster meaningful discussions, and support students' ability to connect theoretical insights with their own emerging professional identities.

6. Discussion and Pedagogical Implications

The implementation of personality-tailored case work in teacher education offers several pedagogical insights with broader relevance for the Scholarship of Teaching and Learning (SoTL). While the intervention described here was limited in scope, it illustrates how individualized learning materials, rooted in psychological self-insight and authentic student experiences, can enhance student agency, support reflective learning, and bridge the gap between theory and professional practice. By aligning learning content with students' dispositions and real-world challenges, the intervention may have encouraged learners to take ownership of their professional development and to engage more deliberately with complex teaching situations. As such, it contributes to ongoing conversations in SoTL about how to design learning environments that are not only adaptive and engaging, but also support autonomy, self-direction, and intentional action.

One of the central observations from this intervention was that students appeared to experience the cases not as generic instructional tools, but as personally resonant scenarios that called upon them to reflect on how their own dispositions might affect their classroom behavior. By engaging with personalized cases, students are invited to develop what Korthagen [11] refers to as phronesis. Practical wisdom grounded in situated reflection. Rather than applying abstract knowledge, they explore how their own dispositions and values shape responses in emotionally and ethically complex teaching scenarios. This aligns with research showing that self-referential and metacognitive learning strategies enhance engagement and depth of processing, particularly in professional education where identity formation is central [22, 23]. The use of Big Five profiles in the design of learning cases gave students opportunities to explore situations that challenged their natural tendencies, such as improvising despite a preference for control, or managing disagreement while low in assertiveness. Such self-awareness is crucial in teacher education, where success often depends on the ability to regulate emotions, adapt behavior, and reflect on one's own teaching. By surfacing these psychological dynamics in a safe and structured context, the intervention supported what Loughran [24] has described as "meaning-making through reflective practice."

Moreover, group discussions enriched the learning experience by exposing students to diverse interpretations and strategies. These dialogic exchanges align with constructivist learning theories, where meaning is co-constructed through social interaction. Students were able to see how personality shapes perception and behavior, and how contrasting approaches can all be pedagogically valid. This collaborative dimension supports earlier findings that peer discussion increases critical thinking and tolerance for complexity [9, 10].

Another challenge was the technical and logistical complexity of delivering the intervention. Although the system was highly automated, using R, Markdown, and OpenAI to generate individualized reports and distribute them securely, its implementation still required technical expertise and institutional support. Nevertheless, the successful deployment of a GDPR-compliant, scalable prototype demonstrates that personalized digital learning is not only feasible within higher education but can also serve as a vehicle for enhancing student agency. By giving students tailored entry points into complex professional dilemmas, the intervention enabled them to assume a more active and reflective role in their learning process.

From a pedagogical perspective, this work illustrates how agency-supportive learning environments can be created by integrating psychological self-insight, digital tools, and structured reflection. The use of real student experiences, gathered through peer interviews and analyzed thematically, further grounded the intervention in the lived realities of the learner cohort. In doing so, it helped close the often-cited theory–practice gap in teacher education [11], not only by making learning more relevant, but by inviting students to make autonomous, informed decisions in response to pedagogical challenges. Finally, this project shows how SoTL can benefit from interdisciplinary synthesis, combining personality psychology, artificial intelligence, and student-centered curriculum design to support more intentional, self-regulated, and agentic learning.

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7. Conclusions

This paper has presented a curriculum innovation that integrates AI-supported personalization and Big Five personality profiling to support student agency in teacher education. By tailoring case-based learning to students' individual traits and practicum experiences, the intervention encouraged autonomy, self-reflection, and context-sensitive decision-making. The design enabled students to engage more actively with theoretical content and to assume responsibility for how they interpret and respond to professional challenges. Although limited in scope, the pilot demonstrated that personalized, ethically compliant learning environments can meaningfully support agentic engagement in higher education. The model offers a transferable approach for designing learning experiences that strengthen reflective competence and empower learners as intentional actors in their own development. Future iterations will include formal evaluation and expanded use of dynamic case formats.

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