Research Studies on Understanding by Design (UbD)

Understanding by Design (UbD)®, developed by Grant Wiggins and Jay McTighe, is an internationally acclaimed curriculum planning framework that prioritizes deep understanding and transfer. It's three-stage "backward design" process begins by identifying desired results, then determining needed assessment evidence, and finally designing instruction and students' learning experiences.

A large body of empirical research in k-12 and higher education shows that UbD can enhance cognitive engagement, promote deeper understanding, and improve student achievement. However, successful implementation depends upon adequate teacher training and on-going, systemic support. The following summary presents key findings from notable studies, followed by an annotated bibliography.

Evidence of Student Learning Gains

Several experimental and quasi-experimental studies point to robust evidence that UbD enhances student learning outcomes. In a well-controlled study, Özyurt et al. (2021) found that primary students taught through UbD-based science units significantly outperformed peers experiencing traditional instruction on both achievement scores and concept retention. Similarly, Almasaeid (2017) reported that eighth-grade students in Dubai using UbD achieved higher scores in science than those taught with conventional methods, with no significant differences found between genders, indicating broad applicability.

Recent research in a cross-cultural context adds further support: Aslam et al. (2024) documented marked gains in science achievement among Pakistani fifth graders taught using UbD, reinforcing the model's value in varied educational settings. These consistent findings on achievement gains underscore that UbD's strategic alignment of learning outcomes, assessment, and instruction contributes positively to student attainment.

Cognitive Growth and Student Engagement

Synthesizing evidence from qualitative research, Uluçınar (2021) conducted a meta-synthesis of studies on UbD and reported widespread improvements not only in cognitive growth, but also in student motivation and engagement. Teachers observed that students developed higher-order thinking skills and greater ability to transfer learning to new contexts—core aims of UbD. However, the review also revealed practical gaps, particularly where goals were ambiguous or teacher training and support were inadequate. In these cases, teachers' capacity for effective backward design was undermined, emphasizing the necessity of robust professional development and support.

Cross-Disciplinary and International Effectiveness

UbD's effectiveness extends beyond the sciences. In the field of English as a Foreign Language (EFL), Hanratty (2023) highlighted EFL teachers' positive perceptions of UbD's coherence and clarity, particularly its capacity to facilitate knowledge transfer. However, many EFL teachers identified challenges in developing authentic assessments and analytic rubrics aligned with UbD principles, pointing to an ongoing need for professional development in these areas.

In music education, Johnson et al. (2017) used surveys and interviews to discover that while some teacher educators embraced UbD's philosophy, their actual use and quality of implementation varied widely—a situation attributed to gaps in preservice and in-service training, ongoing support, and institutional priorities.

Teacher Practice: Alignment and Challenges

A variety of empirical studies agree that a central strength of UbD lies in its alignment of learning goals, assessments, and instructional activities. Tumlos-Castillo (2015), in an initial evaluation in the Philippines, found that teachers developing learning modules with UbD experienced improved clarity in setting outcomes, shaping assessment tasks, and designing sequenced learning experiences. These findings were echoed in the medical education context, where Newell et al. (2023/2024) described how the framework's backward design process enhanced curricular coherence, even in complex higher education settings.

Implementation Challenges

UbD explicitly calls for clarity about long-term transfer goals, the use of performance assessments that require application of learning in authentic contexts, and instruction that engages learners in "meaning making." The reality in many schools is that these UbD elements challenge traditional curricula and instructional practices that emphasize "content coverage" and recall-level testing.

Implementation research reveals systemic and capacity-related barriers to the effective use of UbD. Uluçınar's (2021) synthesis pointed to recurring challenges across qualitative studies: unclear or overly broad goals, insufficient teacher training, and infrastructure constraints (e.g., time, resources, assessment systems) that make it difficult to design and implement UbD units as intended.

Related studies by Tumlos-Castillo, Hanratty, Johnson et al., and Joshi suggest that when educators receive sufficient training and support, UbD can reframe their planning, leading to more coherent, evidence-aligned units. However, they also indicate that achieving this shift at scale is complex and requires sufficient investment to support on-

going professional development, time for curriculum design, and leadership support. Without a systemic approach, the promise of UbD will not be fully realized fully.

Conclusion

In sum, the emerging research base across diverse settings and subjects, in both K–12 and higher education, repeatedly shows that the UbD framework contributes positively to students' cognitive engagement, conceptual understanding, and overall achievement. Key challenges for sustainable implementation include ensuring clear learning targets, on-going professional development, and time and institutional supports for collaboration on curriculum planning. When these conditions are met, UbD's strengths in fostering coherence, transfer, and deep learning are widely affirmed by educators and researchers alike.

A Summary of Selected Empirical Studies on UbD

A variety of studies show significant learning gains when UbD is implemented with fidelity. Note: The studies summarized below vary in type and include experimental, quasi-experimental, action research, or meta-synthesis. A link to the source publications is included for each.

Reference	Context / Design	Key Findings
Uluçınar, U. (2021). *Findings of qualitative studies on Understanding by Design: A meta-synthesis. International Journal of Curriculum and Instructional Studies*, 11(2), 167-194. ERIC	Meta-synthesis of 12 studies (K-12)	Teaching based on UbD improved students' cognitive development and participatory insight; but many teachers struggled with goal/standard creation, evidence collection, teacher capacity.
Aslam, A., Ahmad, S., Siller, H-S., & Nasreen, A. (2024). *Impact of the Understanding by Design Model on the Science Academic Achievement of Fifth Grade Students in Pakistan.* ScienceDirect+1	Quasi-experimental, Grade 5 science, Pakistan	UbD model had a positive impact on science achievement compared to traditional instruction.
Yurtseven, N., & Altun, S. (2017). *Understanding by Design (UbD) in EFL teaching: Teachers' professional development and students' achievement. Educational Sciences: Theory & Practice*, 17(2), 437-461. ERIC	Action research, EFL Teaching English as a Foreign Language, Turkey	UbD in teacher professional development contributed positively to both teachers and students' achievement.

Reference	Context / Design	Key Findings
Kaplan, J., & Shi, T. (2023). *Many lenses with one focus: Making philosophy learning meaningful through collaborative design. Journal of Educational Research & Practice*, 13(1), 462-475. ScholarWorks	Higher ed, introductory philosophy online course	Collaborative use of UbD led to significant student learning growth and engagement in philosophy.
"Learning efficacy of Understanding by Design–Internet of Things (UbD-IoT) education integrated with design thinking and computational thinking." (2023) Emerald	Higher ed/technology context, IoT + computational thinking	UbD model effectively reduced cognitive load and strengthened T-competencies in computational thinking.
"Scripted Curriculum vs. Understanding by Design (UbD) in Biology" (2023) EJRSME	Mixed methods study, biology curriculum	Both groups improved but students in the UbD-designed unit had larger gains; environment, teacher-student relationships matter.
"The Impact of Using Understanding by Design (UbD) Model on Class 10 Students' Achievement in Chemistry" (date unspecified) ResearchGate	Action research, Grade 10 chemistry	Evidence suggests UbD had positive effect on student achievement in chemistry.
"Twelve Tips for Using the Understanding by Design® Curriculum Framework" by Joyes & McHale (2023?) PMC	Higher ed/medical education curriculum redesign	Provides implementation strategies for UbD in a medical education context—important for faculty familiarisation.
"Understanding by Design: A Framework for Effecting Curricular Development and Assessment." (2008) PMC	Review/implementation in science education via UW projects	UbD provided a practical framework for inquiry-based science units, focusing on enduring understandings.
Dack, H., & Merlin-Knoblich, C. (2018). *Improving Classroom Guidance Curriculum With Understanding by Design.* Professional Counselor	K-12 school counselling curriculum	Conceptual paper using UbD to make classroom guidance more meaningful and aligned with student success outcomes.

Source: *Perplexity Pro* Date: 10.29.25Prompt: Understanding by Design® or UbD (Wiggins and McTighe) is a well-known curriculum planning framework. Find research studies on the use of the UbD framework.

An Annotated Bibliography:
Research on the Understanding by Design (UbD) Framework

Uluçınar, U. (2021). Findings of qualitative studies on Understanding by Design: A meta-synthesis.
Synthesizes qualitative UbD studies and reports consistent positives for students' cognitive growth and engagement, while flagging implementation gaps (unclear goals, limited teacher training, infrastructure).

Özyurt, M., Kan, H., & Kıyıkcı, A. (2021). The effectiveness of Understanding by Design model in science teaching: A quasi-experimental study. Eurasian Journal of Educational Research, 94, 1–24.
Quasi-experimental study showing UbD improved primary students' science achievement and concept retention compared with traditional instruction.

Almasaeid, T. F. (2017). The impact of using UbD on 8th-grade students' achievement in science. European Scientific Journal.
Experimental study in Dubai found UbD students significantly outperformed peers in science achievement; no gender differences observed.

Aslam, A., Ahmad, S., Siller, H.-S., & Nasreen, A. (2024). Impact of the UbD model on the science academic achievement of fifth-grade students in Pakistan. Asia-Pacific Science Education, 10(1), 113–153.
Recent study showing significant science achievement gains among UbD-taught students in Pakistan, confirming cross-cultural effectiveness.

Tumlos-Castillo, L. M. (2015). Initial evaluation of UbD framework in writing learning modules. De La Salle University Research Congress.
Early program evaluation showed UbD helped teachers align outcomes, assessments, and learning activities when developing modules.

Hanratty, G. Ç. (2023). Designing units with UbD to teach English as a Foreign Language: Benefits and challenges. Sakarya University Journal of Education, 13(3), 435–455.
EFL teachers valued UbD for coherence and transfer, though many needed support writing authentic assessments and rubrics.

Johnson, D. C., Peterson, A. D., Spears, A., & Vest, J. (2017). Perspectives and practices of music teacher educators: Examining familiarity with and use of UbD.
Survey and interviews revealed variable familiarity and fidelity in UbD use among music educators, highlighting the need for professional development.

Newell, A. D., Foldes, C. A., Haddock, A. J., Ismail, N. A., & Moreno, N. P. (2023/2024). Twelve tips for using the UbD curriculum planning framework. Medical Teacher.
Describes using UbD to align outcomes, assessments, and instruction in a medical education context; confirms its adaptability beyond K–12.

Joshi, M. (2021). Evaluation of the Implementation of Understanding by Design (UbD). Doctoral dissertation, St. Cloud State University.
Examines UbD implementation challenges, noting that teachers require extensive guidance to shift from activity-based to backward design approaches.

ASCD. (2012). Understanding by Design Framework (White Paper). Alexandria, VA: ASCD.
Authoritative summary of the UbD model, explaining its grounding in research on transfer, backward design, and alignment of curriculum, assessment, and instruction.