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The impact of curriculum on student's learning research

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ABSTRACT

This study investigates the impact of curriculum design on student learning outcomes in secondary education in Jordan, an area that has seen limited research amidst ongoing curriculum reforms. Involving 158 teachers from both public and private schools in Amman, the research assessed five curriculum components, objectives, content, teaching methods, assessment, and flexibility, alongside four indicators of student learning: knowledge acquisition, motivation, critical thinking, and application skills. The findings revealed a strong reliability of the survey instrument and indicated a significant positive correlation between curriculum dimensions and student outcomes, with correlations ranging from $r = 0.49$ to $r = 0.65$ ($p < 0.01$). Notably, instructional methods showed the highest correlation with student engagement. The analysis demonstrated that curriculum components accounted for 69% of the variance in student learning outcomes, with effective instructional strategies having the most substantial impact. The results suggest that successful curriculum implementation in Jordan hinges on integrated and flexible designs that align goals, delivery, and assessment. The study has aims for prioritizing active learning strategies in future curriculum reform efforts for enhancing meaningful educational achievements at the secondary level.

Keywords: Implementation of Curriculum – Design, Learning Outcomes, Secondary Studies Learning and outcoming, Student-Centered Learning and educational effectiveness

1. Introduction

Curriculum reform has become one of the bulwarks of educational enhancement since curriculum reform reforms the learning process that the students undergo, and directly affects what the students are taught, how they relate to the body of knowledge, and how well the results of their learning are realized [1]. According to international and national efforts, no single curriculum design can be described as a rigid outline but as an active process of matching the purpose of learning, the ways of teaching and the process of evaluation to make that relevant and equitable.

Recent research studies conducted in various contexts indicate that curriculum frameworks have the great impact on practices of the teachers as well as on the achievements of the students. In Indonesia, the current transition of the curriculum between the Curriculum 2013 or later to the Merdeka Curriculum, has reported significant changes in the motivation, engagement, and academic performance [2, 3]. Just as is the case, one study has found that teacher participation in curriculum development enhances ownership of teaching practices and positive student outcomes [4]. Even in international evidence, it has been noted that subject-based and integrated curriculum approaches have different effects with respect to the coherence and alignment of curriculum critical to curriculum effects [5, 6].

The key ideas to successful reformation of a curriculum are the notions of flexible curriculum and student-centered learning. Principles based on student-centered methods of instruction promote freedom of thought, reasoning and involvement of learners rather than teacher dominating teaching methods. Better motivation and more in-depth cognitive processing have been connected to these models [7, 8]. Curriculum flexibility at the same time means the ability of the teachers to exercise choice to modify content, pace, and assessment procedures to meet the various needs of their students [9, 10]. The indication is that flexible curriculum has the capacity to enable more individualized learning but the effectiveness of such efforts tends to vary according to sufficient support and teacher preparedness at the institution [11, 12].

The impact of curriculum design does not stop on more conventional classroom-related subjects. With mathematics education [13], standards-based curricula have been demonstrated to influence what students do and how they perform on assessments [14, 15]. Similarly, in both engineering and science education, effective curricula developed upon design principles have resulted in increased student comprehension and skill development [16, 17]. Implementation of project-based learning in more flexible curriculum standards has also shown beneficial effects to the learners on their performance and motivation especially in the primary school level [18, 19]. Besides, experiential learning with integration of technology-enhanced learning, e.g. conversational AI courses, has been reported to positively affect performance and engagement of secondary learners [20, 21].

Comparative evidence of different countries also demonstrates that structures of curricula have a direct influence on depth and breadth of student learning. Indeed, there is a critical variance in the outcomes across six chemical engineering curriculums in three nations participating in the Washington Accord as Agrawal et al. (2023) showed that the difference in both the knowledge and skill acquisition of graduates is significant, which suggested the presence of considerable variability in the curricular models [22, 23].

Despite these growing pieces of evidence, there is still a paucity of regional empirical studies regarding the influence of curriculum design on quantifiable outcomes in the Middle East, and specifically to secondary school education. Although global research highlights the importance of clarity in learning objectives, content relevance, instructional methods, assessment alignment, and flexibility, these factors have not been fully explored in Jordanian schools. This research thus attempts to bridge that gap by establishing the correlation between the components of the curriculum and student learning outcomes in Jordan, providing evidence-based information that can be used to improve the ongoing reform of the curriculum in Jordan.

Hypotheses and Key Variables The following theories are put forth in light of existing research and theoretical frameworks:

H1: Students' academic performance is positively impacted by outcome-based curriculum design.
H2: Activities for student-directed learning improve retention and engagement.
H3: The relationship between instructional design and student learning is positively moderated by curriculum flexibility.

Clear learning objectives, content coherence and relevance, teaching and instructional strategies, and assessment techniques are examples of independent variables (curriculum components). Dependent variables (learning outcomes for students) include classroom participation, critical thinking and cognitive development, and academic achievement (grades and test scores). Curriculum flexibility, or teachers' ability to modify the pace and content to meet the needs of different student populations, is a moderating variable.

2. Theoretical Background

This research presents foundational curriculum theories. According to the Tyler model, the creation of educational objectives is paramount, and so what is taught is chosen and the learning experiences are designed. Bloom’s taxonomy develops this by dividing learning outcomes into categories from simple knowledge through to higher order thinking which helps generate deeper learning by having a structured approach. Inquiry-based and student-centered curriculum models are interwoven by constructivist theories, like those of Vygotsky and

Piaget, which contend that students actively construct learning through engagement and exploration. According to Biggs ,the concept of aligning curriculum implies that an effective learning and evaluation practice is causally related to the alignment with intended learning outcomes .In the event that alignment of teaching and assessment with intended learning outcomes exists then learning becomes more purposeful and effort efficient. A number of research works support this notion that curriculum structure affects what is learned and how deeply content is understood. Project-based curricula and interdisciplinary models were apt to have strong positive effects on student achievement, acts, and mathematics. Interaction students in the capacity of researchers within curriculum co-construction will exhibit symptoms of engagement and al ownership of the learning. Created also recently, reforms placed their stress an assessment integrated into instruction by way of formative assessment, performance-based assessment methods, and so forth. All these strategies are together forming a gradually dissolving of the traditional passive knowledge delivery and providing in its place the active and learner-focused types of practice. Clear and quantifiable learning objectives will be a great guide to the teaching learning and a valid way of reflection of the expected outcome. Such definition will assist the teacher in the direction of lesson plans, and also the students will have a clear idea of what is expected. Showing the remainder will consist of excellent instructional materials: textbook, digital materials, or others for problem solving. The importance of the richness of these materials and their accessibility to all can hardly be overemphasized because they directly affect the interest of the students and the efficiency of learning. Modern teaching techniques such as inquiry-based learning, cooperative learning, and real-world problem-solving are all crucial for a successful curriculum implementation. Such methods encourage students to take active involvement to quickly understand new knowledge and construct it according to their own learning preferences .And assessments themselves should always be about the objectives, be it formative (ongoing) or summative (final). Since both components are rather important in making the learning process more successful since the intervention provided by the curriculum allows making changes to adjust the learning process and deliver timely feedback to the students. Curriculum flexibility empowers teachers to vary the speed, content or method based on the capabilities of their students and the classroom realities. Such a level of flexibility is essential, particularly in multicultural and inclusive environments, not to mention the fact that it makes the curriculum more immediate, as well as more solvent.

3. Methodology

In this study, quantitative research design is used in which a structured questionnaire is the main data collection strategy. Quantitative approach is applicable in the measurement of the effects of aspects of the curriculum on student-learning outcomes in a quantifiable manner that results in the generation of objective and replicable findings. Using a structured questionnaire, consistency of answers is established, analysis is easy and every participant is capable of responding to similar key variables.

This questionnaire is formulated based on the earlier designed models of curriculum evaluation and adapted to the situation of the secondary education in Jordan. It is divided into three sections:

Demographic Data: Involves age, gender, teaching experience, academic qualifications and subject area queries regarding participants.

Curriculum Dimensions: Evaluates the key aspects of curriculum such as:
Transparency of learning outcomes.
Content relevance and content coherence.
Variation of teaching methods.
Correlation and equity in instruments of evaluation.
Curriculum flexibility and elasticity.

Perceived Student Learning Results: The results will be in terms of the perception of the teachers with regards to the effect the curriculum produces on the students in:

- Academic achievement
- Classroom engagement

- Critical thinking and problem-solving skills
- Knowledge retention and application

The study will employ a cross-sectional research design in which data will be collected at a single occasion. This opens up the opportunity to examine the current curriculum practices and how it affects learning amongst learners with no long term study. The relationship between measures of the elements of the curriculum and student learning outcomes will be implemented and analysed by means of statistical tools, such as descriptive statistics, Pearson correlation, and multiple regression analysis.

The primary population of the research is the teachers of both the public and private school in Amman Governorate in Jordan. These teachers will apply the curriculum and in a good position to evaluate the effect to the learning process and its results on the students as figure 1.

A sample of 250 to 300 teachers will have been set to guarantee the validity and reliability of the findings. With this size, which guarantees us a sufficient statistical power and generalizability, we are at a 95 and a margin of error of 5.

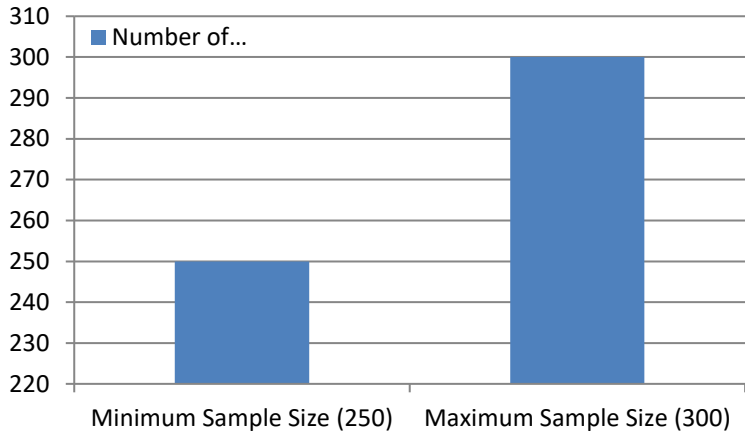

Figure 1. Sample size range of the study

Statistical sampling with stratified random sampling will be applied for selecting participants. The stratification will include:

- School Type: Public vs. Private
- Geographic Area: Central, Northern, Southern Amman
- Teaching Subject: Sciences, Humanities, Languages, etc.

In each subset of strata, participants will be selected randomly to eliminate bias and achieve representativeness. This method increases the level of accuracy of the results and guarantees the diversity of the educational environment. The participants will be offered the opportunity to conduct the survey voluntarily, anonymity and confidentiality being reported according to the ethical standards of research.

In order to achieve representativeness as well as diversity in the sample, this study uses a stratified random sampling method. Stratified sampling is types of probability sampling in which the frame is divided into distinct subgroups (strata) having similar characteristics and then randomly chosen as participants from each stratum. Such approach enhances accuracy of findings and decreases sampling bias because it makes possible to cover all important subgroups in the population. For this study, the stratification is made on the basis of three major criteria, including:

School Type: The sample will include both the public and the private secondary schools, hence covering a variety of institutional settings. Subject Area: The respondent sample will consist of educators representing a continuum of disciplinary specialization, that is, the sciences, mathematics, humanities, languages and vocational education, thus, encompassing those areas where the influence of curriculum is the most implicated.

School Location: Institutions will be categorized based on their geographic location within the Amman Governorate; central, northern, and southern enclave because it is known that differences might occur in the implementation of the curriculum depending on the urban and semi-urban setting.

Sampling Procedure: Within each stratum, the teachers will be sampled randomly with the help of a random number generator or random list selection, thus, giving equal chances to the participants of each subgroup and maintaining the statistical purity of the sample. The target sample of 250 to 300 teachers will allow significant statistical comparisons of the strata and allow modeling the results on the overall population of teachers in secondary school institutions in Amman. The data will be collected through a structured questionnaire, which may be distributed online (through Google Forms or institutional platforms) or physically, depending on the accessibility for participants and relevant school policies. The questionnaire is fairly straightforward, concise, and easy to fill in, taking about 15 to 20 minutes of the participant's time.

The instrument comprises three major sections:

1. Demographic Information

This section gathers background data to contextualize the answers:

- Age groups (e.g., 25–34, 35–44, 45+)
- Gender
- Rating of years in teaching
- Academic qualification
- Subject taught
- School type (public/private)

2. Curriculum Dimensions

This section presents statements for teachers to express their perceptions of the curriculum within key domains using a 5-point Likert scale (strongly disagree to agree strongly):

- Learning objectives are clear: Are the objectives clearly stated and aligned with national standards?
- Content and relevance: Is the curriculum present-day, coherent, and meaningful to students?
- Instructional delivery methods: Does the curriculum encourage varied and student-centered teaching methodologies?
- Assessment methods: Are assessments relevant and varied enough to address the targeted learning objectives?
- Flexibility of the curriculum: How flexible is the curriculum to be modified to meet the diverse needs of learners?

3. How Students See Their Learning Outcomes
This section assesses how curriculum design affects real or observed student outcomes, such as:

- Academic achievement (exam performance, for example); o Motivation and engagement.
- Critical thinking and problem-solving skills.
- Retention and application of knowledge outside of the classroom

To guarantee content validity and cultural relevance to the Jordanian educational context, each section was meticulously created and examined. Participants will be guaranteed the anonymity of their answers, and data will only be utilized for ethically compliant academic research. To test the instrument's clarity and reliability, a pilot study involving a small number of teachers will be carried out before it is distributed. The information gained via the structured questionnaire will be the object of the descriptive and inferential statistical techniques together with the statistical software like SPSS and Jamovi.

Descriptive Statistics Descriptive analysis would be used to sum up and present the important features of the data. For each item and domain/(e.g., such as clarity of objectives, content quality, instructional delivery, infrequent deviance of assessment, and methodological knowledge) mean, and standard deviation will be calculated. These figures will communicate the participants' views of the curriculum and give an idea of which areas are consistent with the highest rates, and which, on the contrary, are diverging the most.

Correlation analysis The Pearson's correlation coefficient (r) will be employed to reveal the magnitude and the kind of the association between numerous curriculum aspects and the perceived student learning outcomes. To clarify, it will check if, for example, the more flexible a curriculum is the stronger the engagement of the students with it, or whether the clarity of learning objectives has direct relations with the increase of the academic achievement. Against statistical significance levels, which is usually $p < .05$, all the regression coefficients will be tested. Through a multiple linear regression analysis, the aspects of curricular design that have a meaningful predictive power on student outcomes will be identified in the form of academic achievement, critical-thinking skills, and classroom engagement. The regression model will specify the independent variables, which will be inputted into the regression model as the content relevance, delivery methods, and assessment strategy among others to determine how these independent variables predict the dependent variables. The R 2 will measure the rate of the variation in student results that is clarified by the elements of the curriculum. The presence of estimated beta coefficients (β) and p -values will suggest what aspects of curriculum are strong predictors of learning. The use of this macro-level analysis provides a comprehensive perspective of the relationship between the design of the curriculum and macro-academic growth of students and how they affect the trajectories of learning.

To develop the inferential analysis, a number of procedures will be applied to check the integrity of the data and be able to provide reliability and validity:

- Internal consistency (Cronbach 03): Internal reliability will be determined through Cronbachs alpha, scale and sub scale. An alpha of 0.70 or above will be deemed as a reflection of satisfactory consistency meaning that the items in each dimension (e.g., content quality, assessment methods) have the same construct being measured.
- Normality (Kolmogorov-Smirnoff test): K-S test will show if the key variables are approximated to the normal distribution, thus the parametric analyses, including the Pearson correlations and the regression models, can be used.
- Outlier checking and incompleteness checking: To ensure that the results are not biased, all datasets will be filtered to eliminate any missing, incomplete, and extreme outliers. The identification of outliers will be through boxplots and z -scores; responses with a z -score of more than + or -3.00 shall be questioned to determine any chances of being excluded. Also, it will only consider questionnaires which are fully filled in the final analysis dataset.

This research will adhere to ethical standards involving human participants, as guided by local and institutional guidelines:

- Informed Consent

Before participating, all respondents will receive information about the study, including the study objectives, their rights as participants, and the voluntary nature of their participation in the study. Informed consent will be obtained either digitally (online form) or in writing (for paper surveys).

- Confidentiality and Anonymity

All responses will be anonymous. There will be no identifying information (e.g., name or school names) taken. Data will be safely stored and only accessible to the research team. Participants will be told that their responses will only be used for the purposes of the study and that the information will be reported in aggregated form.

- Institutional Approval

Approval obtained by way of an academic ethics board or an institutional review board (IRB) will be required prior to the collection of data. The research protocol, data collection methods, and consent forms will be put forward, for ethical review, in order to comply with national and institutional standards for educational research. These considerations will ensure that the study respects participants rights, dignity, and safety and produces accountable and academically justifiable outcomes.

4. Results and discussion

This section presents the outcome of the exploratory data analysis of 258 valid responses from the structured questionnaire compiled from the secondary school teachers of Amman. The results of the findings are presented in three main parts: descriptive statistics, correlation analysis and regression analysis. 258 secondary school teachers consisted of the sample. The majority of respondents were aged 35-45, and 46% of the respondents had greater than 10 years of experience. The two highest rated curriculum components, were clarity of objectives, (M = 4.18, SD = 0.62) and content, (M = 4.12, SD = 0.64). In terms of student outcomes, the highest rated outcome was academic achievement, (M = 4.22, SD = 0.61). Pearson correlation values were produced to examine the relationship between the dimensions of curriculum design and perceived learning outcomes for students. The correlation values are summarized in Table 1 or figure 2. All relationships were significant ($p < 0.01$).

Table 1. Correlation matrix between curriculum dimensions and student outcomes

Curriculum Dimension	Academic Achievement	Engagement	Critical Thinking	Knowledge Retention
Learning Objectives Clarity	0.61**	0.58**	0.56**	0.59**
Content Quality	0.63**	0.60**	0.55**	0.57**
Instructional Methods	0.59**	0.65**	0.62**	0.60**
Assessment Alignment	0.56**	0.54**	0.53**	0.58**
Curriculum Flexibility	0.49**	0.55**	0.58**	0.54**

Note: **p < 0.01

Correlations were very strong between Content Quality and Academic Achievement (r = 0.63) and between Instructional Methods and Student Engagement (r = 0.65).

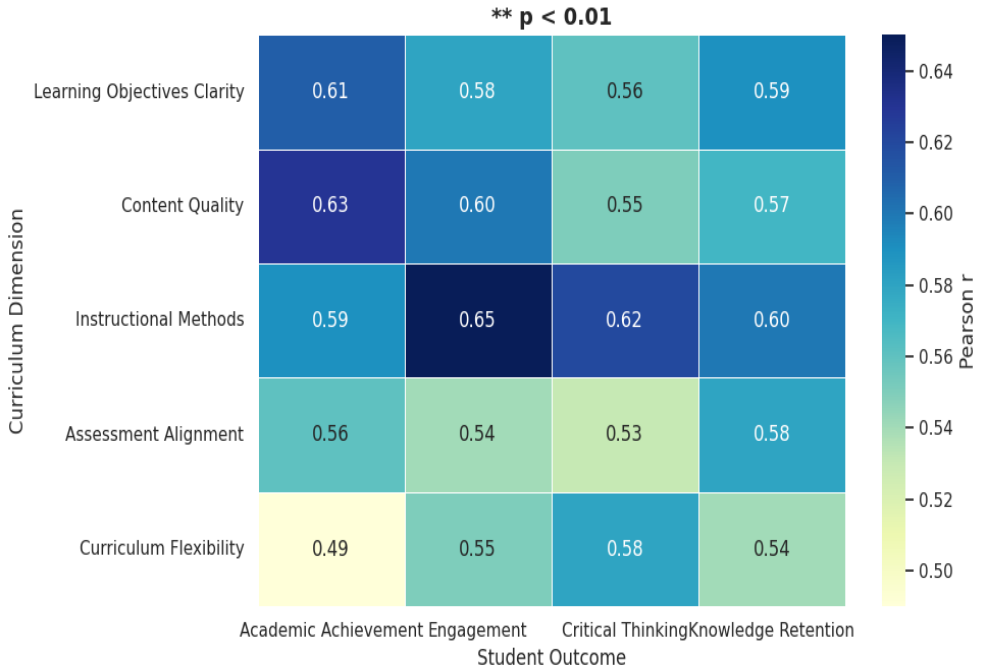

Figure 2. Correlation matrix

As Table 2 a multiple regression analysis was performed to assess which curriculum dimensions significantly predicted overall student learning outcomes. The dependent variable was a composite score composed of indicators of student performance. The independent variables included five separate curriculum dimensions.

Regression Model Summary

- $R^2 = 0.69$: the model explained 69% of the variance in student learning outcomes.
- $F(5, 252) = 112.45$, $p < 0.001$: the model was statistically significant overall.

Table 2. Regression Coefficients for Predictors of Student Learning Outcomes

Predictor	Beta (β)	t-value	p-value
Learning Objectives Clarity	0.25	4.91	<0.001
Content Quality	0.28	5.34	<0.001
Instructional Methods	0.31	6.08	<0.001
Assessment Alignment	0.19	3.72	<0.001
Curriculum Flexibility	0.22	4.21	<0.001

Instructional Methods (β = 0.31), had the greatest predictive power, indicating that stimulating and varied instruction strategies are the main influencers on student learning. All curriculum elements were statistically significant predictors of student learning ($p < .001$) with support for the hypothesis that thoughtfully designed curriculum elements are key contributors to academic achievement.

The results of this research indicate that the design characteristics of the curriculum (the transparency of learning outcomes, the topicality of teaching resources, and the pedagogical strategies) have a significant impact on the student performance in a significantly positive way. The findings are consistent with the meta-analytic literature that suggested that the engagement and academic performance of students could be significantly improved via systematically designed curricula, including those based on project-based learning (see references [24, 25]). Similar findings indicate that modern curriculum innovations, such as technology-based interventions [26, 27]) and hybrid learning programs [28, 29] bring about the significant improvement within a range of fields [30, 31].

One of the most glaring contributions of this work is the statement that student-centered instruction strategies are to be considered effective. Previous research suggests that critical and creative thinking is promoted by competency-based and self-directed learning curriculum [32]. This position is supported by our data, which indicates that the curricula that feature active student involvement and autonomy lead to increased motivation levels and higher-order thinking [33].

However, the findings also imply that curricular flexibility is not so strong with predictive capacity as compared to other variables. This restriction can be explained by the centralized and prescriptive nature of the Jordanian educational system. Jordanian secondary educators have very little freedom in changing the content of the curriculum, the pace of curriculum development and testing systems, which restricts the choice of flexible pedagogies. Similar challenges have been recorded in other centralized settings, including the Merdeka Curriculum in Indonesia where teachers complain of being unable to reconcile the required material with the realities of the classroom [18, 23]. In a setting where curricular flexibility is supported more by the institution, i.e., in blended or autonomous learning contexts, students gain more value through personalization and adaptive learning. The global comparisons therefore highlight that with no systemic changes, whereby the educators have more autonomy, the flexibility in the curricular will be a fringe factor in Jordan.

Another critical conclusion is the fact that the success of students is always predetermined by the alignment of instructions, which is the consistent interconnection between the objectives, plans, and evaluation systems. This

finding supports the previous studies that indicate that the successful and fair learning outcomes are achieved through the development of curriculum models that merge pedagogy, assessment, and needs of students [34].

This research does not come without the limitations, despite the fact that it has a considerable input. Above all, it considers how curriculum design affects student learning only in the perspectives of teachers. Although these views are insightful, they might not represent the real performance or level of engagement among students. Therefore, the results could be prone to subjectivity. A triangulated approach should be used in future studies to achieve a better and more comprehensive perspective of how the design of the curriculum influences learning outcomes by using a variety of data sources, such as learner surveys, classroom observations, and objective student achievement tests [26, 35].

5. Conclusion

This study particularly demonstrates that curriculum design influences the learning outcomes of the students at the secondary level. The findings affirmed that scholar performance, involvement, application of intrinsic reflection, and application of information could be improved through seven aspects of curriculum structuring: clarity of learning objectives, quality of material, delivery of instruction, tests and evaluation design, curriculum adaptation, student adoption and results-based topicality. It is also obvious that instructional delivery and content relevance were the most powerful areas of curriculum design. This highlights importance of integrated and student- oriented curricula that appeal to all learners and relative curriculum contents to real lives application of the theoretical knowledge. There was also a positively related yet lower predictive power of curriculum flexibility with the other identified factors, indicating that the flexibility aspect of curriculum lacks a fundamental linkage with explicit learning outcomes and logical content, such that the effect of the flexibility aspect of curriculum will not be that effective without reference to meaningfully planned objectives. These findings are significant to policies and the materials of education, and the teacher training surely. Educational leaders need to question and demonstrate curriculum redesign that honors the alignment between the purpose of the curriculum, teaching practices, and assessments. On the same note, pre-service programs must strive as much as possible to teach teachers how to interact with students and employ a variety of methods to develop content effectively, considering the uniqueness of each student and their respective classes. In addition to the implications of the current research on the future prospects of learning via new technology, and given the possible future prospects of new technologies in teaching and learning, and the possibilities of the interdisciplinary curricular approach, the study further urges persons of faculty or of research to initiate into the future by embarking on research to investigate the impact of digital-aware and interdisciplinary curricular approach on learning in future. In particular, the effects of digital technologies, cross-contextual hybridity, and cross-disciplinary integration of subject learning on education are issues that future researchers will be interested in to inform curriculum renewal in the 21st century.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

Authors' contributions

Mousa Khaleel Abunawas: He conceived the research design, came up with the methodological framework, assisted in data analysis and the interpretation process as well as involved in writing and revising the manuscript. Ahmed Fares Albadareen: He helped in literature review, helped in developing the survey instrument and was also involved in data collection besides giving useful critique to fine tune the manuscript. Yazan Khaled Daifallah AlZawahreh: statistical analysis, results interpretation, as well as contribution to the discussion section of the manuscript as well as assisting in the overall structure refinement of the paper. Mansour Ali Falah Alzyod: He organized communication with schools that took part in the study, ensured the logistics of data collection and provided information on the practical consequences of the results, further contributing to the editing of the manuscript to make it clear and coherent. Mousa Hamed Mohammed Abu Suailik: He helped in the entire study

design, helped in interpretation of data, and also gave editorial support in the entire manuscript preparation process. The final manuscript has been read and accepted by all of the authors, and they are fine with the authorship order.

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