

 Research Article

Teachers' Beliefs and the Flipped Classroom in Saudi Arabia: A Qualitative Study of Science Instruction

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Abstract

This qualitative study, grounded in Dewey's constructivist theory, explores how six Saudi Arabian secondary school science teachers view and use the flipped classroom as an active learning approach. The research adds to the growing conversation about science education in Saudi Arabia, especially in light of Saudi Vision 2030, which aims to bring more technology and innovative teaching strategies like the flipped classroom into schools. Using a case study design, the study draws on interviews, classroom observations, group discussions, and teaching materials to understand teachers' beliefs. The findings show that teachers hold a mix of views about using the flipped classroom, including ideas about teaching science, their students' learning, their own roles as teachers, and how all of this connects to the goals of Saudi Vision 2030. Teachers seemed most influenced by their beliefs about science teaching and their professional roles. The results suggest that teachers are more likely to adopt new teaching methods when those methods fit with what they already believe is effective. This highlights why it's so important to consider teachers' beliefs and experiences when rolling out new strategies like the flipped classroom as part of educational reforms. The findings yield two key implications. First, educational reforms introducing transformative instructional approaches, such as the flipped classroom, should explicitly account for teachers' beliefs. Teachers' belief systems are complex, dynamic, and central to instructional decision-making; consequently, they strongly influence whether new pedagogical approaches are adopted, adapted, or resisted. Ignoring these beliefs may limit the effectiveness and sustainability of reform efforts. Second, curriculum developers integrating flipped classroom approaches into science curricula should actively incorporate teachers' perspectives during the design process. As practitioners with direct classroom experience, teachers possess critical insights into what is pedagogically viable, as well as the potential strengths and challenges associated with implementing innovative instructional strategies.

Keywords: Beliefs, Flipped Classroom, Secondary Science Teachers, Saudi Arabia

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1. INTRODUCTION

Digital transformation is a key focus of Saudi Vision 2030 and has quickly become an important part of education in Saudi Arabia. The national reform plan highlights the use of technology to improve teaching and learning and create a more engaging classroom experience (Ministry of Education, 2018). Although these changes are still being rolled out, digital transformation is already seen as a central part of the country's educational goals (Alotaibi, 2021).

One approach linked to this digital shift is the flipped classroom—a teaching method that aims to make learning more interactive and engaging. By focusing on student involvement and better use of class time, the flipped classroom fits well with the goals of Saudi Vision 2030. Since teachers play a central role

in how these new strategies are put into practice, it's important to understand their beliefs, especially in the context of teaching science in Saudi Arabia.

This focus matches wider educational reforms in Saudi Arabia, which encourage more active, student-centered teaching in science (Allmnakrah & Evers, 2020). To support these changes, the Ministry of Education has started training teachers in new methods like the flipped classroom. Still, there's not much research on what Saudi teachers actually think about using the flipped classroom in their own classrooms. It is important to explore this gap, since recent research shows that teachers' beliefs strongly affect how they teach and whether they adopt new methods. Experts have called for more attention to these beliefs when trying to reform education (Al Harthi, 2008). This is especially relevant as Saudi science teachers begin to use the flipped classroom as a new way to teach.

Even though there's a lot of research about the flipped classroom as a teaching method, we still don't know much about what Saudi teachers believe about using it in their own classrooms. This gap makes it hard to understand how the flipped classroom is actually being used in Saudi schools. Teachers' beliefs are key; they shape how teachers teach and whether they try out new ideas (Durán Narváez et al., 2013; Kaymakamoglu, 2018; Pajares, 1992; Tsai, 2002; Uzuntiryaki et al., 2010). It is also important to find out if teachers' beliefs are changing or a mix of old and new ideas, especially as they adapt to big changes like Saudi Vision 2030. While there's plenty of research showing that the flipped classroom can help students learn, this study focuses instead on what Saudi science teachers believe about it and how their beliefs affect their teaching. The study is guided by the following questions:

1. What beliefs do Saudi Arabian science teachers hold about the flipped classroom as an active learning strategy?
2. How are these beliefs related to teachers' instructional goals when implementing the flipped classroom as an active learning strategy?

1.1. Significance

There's been a growing interest in what teachers believe and how these beliefs shape their teaching, especially as schools move toward more modern, student-centered approaches (Alkış Küçükaydın & Gökbulut, 2020; Alabdulkareem, 2016). In Saudi Arabia, current science education reforms encourage teachers to use more active and engaging teaching methods (Allmnakrah & Evers, 2020). To help with these changes, the Ministry of Education has started training teachers in new strategies like the flipped classroom. Since teachers are so important to making these new ideas work, it's crucial to understand what they think about using the flipped classroom. Plus, because there aren't many studies about Saudi teachers' beliefs on this topic, this study aims to fill that gap by exploring their views and experiences.

1.2. Framework

This study is based on the idea of constructivism—the theory that people learn best by building their own understanding through experience and social interaction. Dewey's work (1929, 1938, 1958) is key here. Flipped classrooms give students more chances to work together and learn from each other and their teacher, instead of just listening to lectures. Rather than spending class time on passive listening, students in flipped classrooms use that time for group work, problem-solving, and discussions. This is a big shift from the traditional classroom, where students mostly listen and do homework alone.

A big idea in constructivism is that people learn best by connecting new information to what they already know and have experienced. In this approach, learning is built on experience, not just memorizing facts. The teacher's job changes from simply giving out information to being more of a coach or guide—someone who helps students make sense of what they're learning (Ültanir, 2012). Students take a more active, central role and get to own the learning process (Xu & Shi, 2018). When class time isn't just for lectures, students have more chances to dig into the material and take charge of their learning.

The flipped classroom fits well with Dewey's ideas about learning by experience (Dewey, 1938). Both Piaget and Dewey believed that real learning happens when students get involved and work with ideas, not just copy what they're told (Stone, 2012; Alamri, 2019). In this study, we look at the flipped classroom

through this constructivist perspective, focusing on how experience shapes learning. Of course, how well the flipped classroom works depends on things like the teachers, students, subject matter, and learning goals.

Another key part of the flipped classroom is using technology to help students move from just understanding concepts to actually using them. Lessons are usually recorded so students can watch them whenever it works best for them. This means teachers can spend class time on activities like discussions, group work, and hands-on projects instead of lecturing (Johnson & Johnson, 2014). As Bergmann and Sams (2012) point out, flipping the classroom gives students more time in class for exploring, asking questions, and learning by doing.

2. METHODOLOGY

This study uses a constructivist approach, which is a good fit because the research is based on qualitative data, mainly what participants say, not numbers. Constructivism is built on the idea that people create their own understanding of the world through their experiences and interactions with others (Kivunja & Kuyini, 2017; Creswell & Poth, 2018). Instead of thinking of knowledge as something fixed and objective, constructivism sees it as something built together, shaped by both the participants and the researcher.

In constructivism, reality is seen as something people build together through social interaction, not just one unchanging truth. This makes constructivist research a good match for studies that want to understand how people make sense of their lives, using interviews, observations, and case studies. Qualitative research in this tradition values the researcher's self-awareness and recognizes that everyone's experience is unique (Shufutinsky, 2020). By using methods like interviews and observation, researchers get a deeper understanding of what's really important to participants and how they see the world (Antwi & Hamza, 2015; Lincoln et al., 2011).

With this approach in mind, we chose a qualitative case study for this research. Case studies are great for digging deep into complex topics in real-life settings, like how Saudi science teachers use the flipped classroom (Stake, 1995; Zainuddin & Halili, 2016). Case study research collects detailed information from different sources over time, helping researchers build a full picture of what's really happening (Creswell & Poth, 2018; Kumatongo & Muzata, 2021; Yin, 2003).

This case study made it possible to look closely at teachers' beliefs in a specific Saudi school context. It also recognizes that each teacher's beliefs are shaped by their background, experience, and environment. Using a case study fits well with the aim of understanding these different perspectives through a constructivist lens.

2.1. Context and Participants

This study took place at an all-girls secondary school in Saudi Arabia. Along with looking at the general school environment, we paid attention to how the school used educational technology to support flipped classroom lessons. To show how the school was set up for this, we included photos and drawings of the technology and classroom spaces.

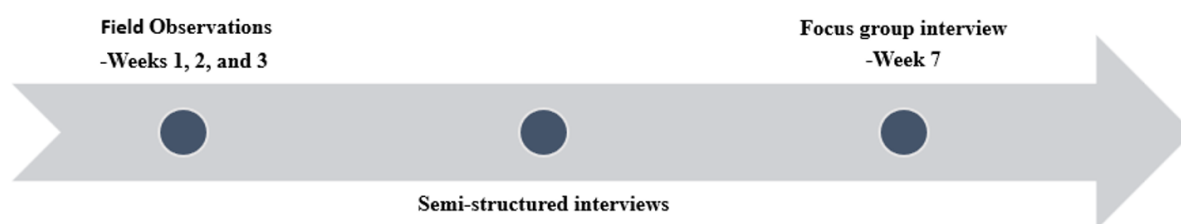
Six female science teachers took part in the study. Each teacher gave written consent after the research was approved by the university and the school principal. To keep their identities private, we used pseudonyms, and everyone knew they could skip questions or leave the study at any time. Table 1 provides details about the teachers, including their years of experience, the subjects they taught, and their qualifications.

2.2. Data Collection

To gather rich data, we used several qualitative methods: observing classrooms, holding one-on-one and group interviews, and collecting classroom materials. Figure 1 shows the timeline for collecting this information.

Table 1. Participant Demographic Characteristics

Participant	Age	Nationality	Teaching Experience	Subject Area	Grade Levels Taught	Qualifications	Years of Technology Use
Huda	28	Saudi	2 years	Physics	10–12	Bachelor's degree and professional teaching license	4 years
Warda	37	Saudi	14 years	Physics	10–12	Bachelor's degree and professional teaching license	14 years
Nora	35	Saudi	10 years	Chemistry	10–12	Bachelor's degree and professional teaching license	10 years
Reem	30	Saudi	7 years	Chemistry	10–12	Bachelor's degree and professional teaching license	7 years
Fatemeh	32	Saudi	5 years	Ecology	10–12	Bachelor's degree and professional teaching license	5 years
Maryam	37	Saudi	10 years	Biology	10–12	Bachelor's degree and professional teaching license	10 years

**Figure 1.** Timeline

Observing classrooms in action was a key part of this study. The first author in this study gathered information from what people said, what they wrote, and from images like photos and drawings (Creswell, 2012). The focus of the observations was on how participants used the flipped classroom, what they believed about students' roles, how they interacted with students, and how they supported individual learning.

When taking notes, the first author focused on three things: how teaching was done (traditional or more interactive), how participants and their students worked together (including how participants supported different learning needs and teamwork), and what kinds of teaching tools were used. To keep things organized, the first author followed a set observation protocol (Ciesielska et al., 2018). The first author wrote detailed notes while watching lessons, recorded audio, and wrote reflections after each observation. This gave three main sources of information: written notes, photos, and my own memos.

Interviews and Focus Group: The first author talked with participants both one-on-one and as a group to understand their thoughts, experiences, and opinions about the flipped classroom. These conversations helped participants reflect on their own ideas and discuss new ones that came up during the study. Each participant took part in three interview sessions, each about half an hour or more, and answered a total of 18 questions. For example, we asked, “*What do you think about the support you get from school leaders for using the flipped classroom?*” and “*When do you feel encouraged to use the flipped classroom in your science teaching?*”

The first author also held a focus group with all the participants that lasted over an hour. The group discussed their best teaching moments, the pros and cons of the flipped classroom, examples from their own lessons, and how the flipped classroom fits with Saudi Vision 2030 and science education goals.

Artifacts: The first author also collected classroom materials to get a better sense of how the six participants used the flipped classroom and what they believed about it. These included worksheets, group projects, videos made by participants, online resources, and materials from class discussions. The first

author took photos of classroom activities, too, to help confirm and illustrate what participants said and did.

Anecdotal Data: Right after classroom observations, the first author wrote down informal comments and conversations. These off-the-cuff moments gave helpful context and a deeper look into how participants saw their teaching and the flipped classroom approach (Hofer & Pintrich, 1997).

2.3. Data Analysis

We analyzed data from the focus groups and interviews using thematic analysis (Braun & Clarke, 2006). This approach helps organize the information into main topics, making it easier to understand what participants think and how they experience the flipped classroom.

2.4. Trustworthiness

To make sure the research was trustworthy and accurate, we used several strategies: checking data from different sources (triangulation), getting feedback from colleagues (peer debriefing), and having participants review the findings (member checking).

Triangulation. We collected and compared information from four sources: observation notes, interviews, focus groups, and classroom materials. Looking at different types of data helped confirm the findings and made the research more reliable (Creswell & Poth, 2016; Lincoln & Guba, 1985). Recording audio added another layer of accuracy.

Peer Debriefing. We asked colleagues for their feedback on the research process and results. Sharing early findings at a national conference helped us see how clear and convincing the study was, and their comments made the work stronger (Lincoln & Guba, 1985).

Member Checking. We asked the participants who took part in the study to look over the findings and interpretations to make sure they were accurate (Creswell & Poth, 2016). Their feedback helped catch any mistakes or misunderstandings and made the results more trustworthy.

3. FINDINGS

After analyzing the data, we found that the participants in this study had four main types of beliefs, organized by how often they came up in conversations and interviews (Braun & Clarke, 2006).

3.1. Beliefs About Science Instruction Using the Flipped Classroom Strategy

Participants in this study saw the flipped classroom as an active, hands-on way to teach that puts students at the center of learning. They felt it helped students dig deeper into science ideas and gave participants more time in class to focus on understanding, not just content delivery. Participants said the flipped classroom worked especially well for some science topics, but not all. They also believed this approach led to more interaction between participants and students. Here is an example of what the participants said in their interviews:

Warda (Physics): Active learning strategies create bonds among the students. I expect the flipped classroom strategy to be active, as it aligns with one of the goals of the Kingdom's Vision 2030. In research and reading, each student depends on herself. The student is researching and elaborating on information, which is a very effective strategy. This strategy is active because the student gets used to relying on herself; she begins to arrange her thoughts. (Individual interview)

3.2. Beliefs About Students and Student Learning of Science Content

Participants also believed the flipped classroom helped students connect what they already knew to new ideas in science. They saw this method as a great way to get students working together, discussing, and

solving problems as a team. Another big belief was that the flipped classroom made students more independent, letting them take charge of their own learning and act as researchers in science. For instance:

Huda (Physics): *Of course, this strategy encourages the student to create a link between the previous information she has and the new information, because the educational environment she has created for herself is ready to receive the new information and link it with the previous information. By contrast, when the student comes to class, her psyche may be uncomfortable due to the large number of classes and a long time being bored, so she does not receive and cannot make a link between the previous information and the new information. She has the new information that is shown in the video. The flipped classroom strategy allows and encourages students to acquire new information and link it to previous information (Individual interview).*

3.3. Beliefs About the Self as Teacher

Participants noticed their own roles changed when they used the flipped classroom. Instead of just giving out information, they became more like guides or coaches, helping students understand science and supporting them as they learned. The participants talked about how this shift affected their teaching in the interviews below. For example:

Nora (Chemistry): *When using the flipped classroom strategy, it is my role to ensure the information reaches them through classroom activities. I focus on information that is difficult to understand. (There is a lot of information, including easy information and difficult information.) When I apply the flipped classroom strategy, it becomes my role to deliver only the difficult information that did not get through to my students via the video they watched, because I enter the classroom as their supervisor (Individual interview).*

3.4. Beliefs About Science Instruction: Flipped Classroom Strategy and Saudi Vision 2030

Participants also felt that using the flipped classroom matched the goals of Saudi Vision 2030. They saw this strategy as a way to help students become more independent, build research skills, and take responsibility for their own learning in science. The flipped classroom was seen as a tool for supporting the country's big education reforms. For instance:

Reem (Chemistry): *Vision 2030, among its objectives, included many strategies intended to enhance the roles of students and teachers, and aimed to develop and document learners' skills and abilities at various educational stages, as well as to provide modern educational methods. We need to move students away from conventional, indoctrinatory education toward modern education strategies that include digital learning. All this helps increase the degree of assimilation, understanding, and skill acquisition more easily than with the indoctrination method, where not all information reaches the student. The flipped classroom strategy puts me on the student's side, helping me develop the student's personality, build it, and help it acquire skills. What is difficult for them to comprehend is that when I develop the student's personality in this way and build it, it becomes easier, and the student acquires many skills from the beginning of her education to the last stage of education; it is not difficult for her to comprehend these changes or what will happen to her from one educational stage to another. And this is the result of strategies: they will successfully move from one educational stage to another when they get used to these things and go through programs like this, because this creates a student who is self-confident and has a strong personality with multiple skills. They go through the various stages of education until they have mastered multiple skills, all of which they acquire from the beginning. (Individual interview).*

Looking at participants' beliefs about the flipped classroom, the study found that many participants held a mix of views. Some beliefs supported active, student-centered learning, while others reflected more traditional ways of thinking, especially for specific science topics or situations. Figure 2 shows how these mixed beliefs fit within the larger goals of Saudi Vision 2030 and the push to use the flipped classroom in schools.

When participants talked about the flipped classroom, they often described it as a way to make learning more active and student-focused. They said it gave them more time in class to teach science deeply and let students and teachers interact more. Participants also felt this approach lined up well with the push for digital learning in Saudi Vision 2030. The study found that participants believed the flipped classroom

helped students share ideas, connect old and new knowledge, work together, and become more independent as science learners.

However, not all beliefs were focused on new ways of teaching. Some participants thought the flipped classroom only worked well for certain science topics. Others felt their own role had changed a lot when using this approach. Participants also pointed out that some students weren't used to the flipped classroom yet, and that starting this way of learning earlier in school could help students adjust.

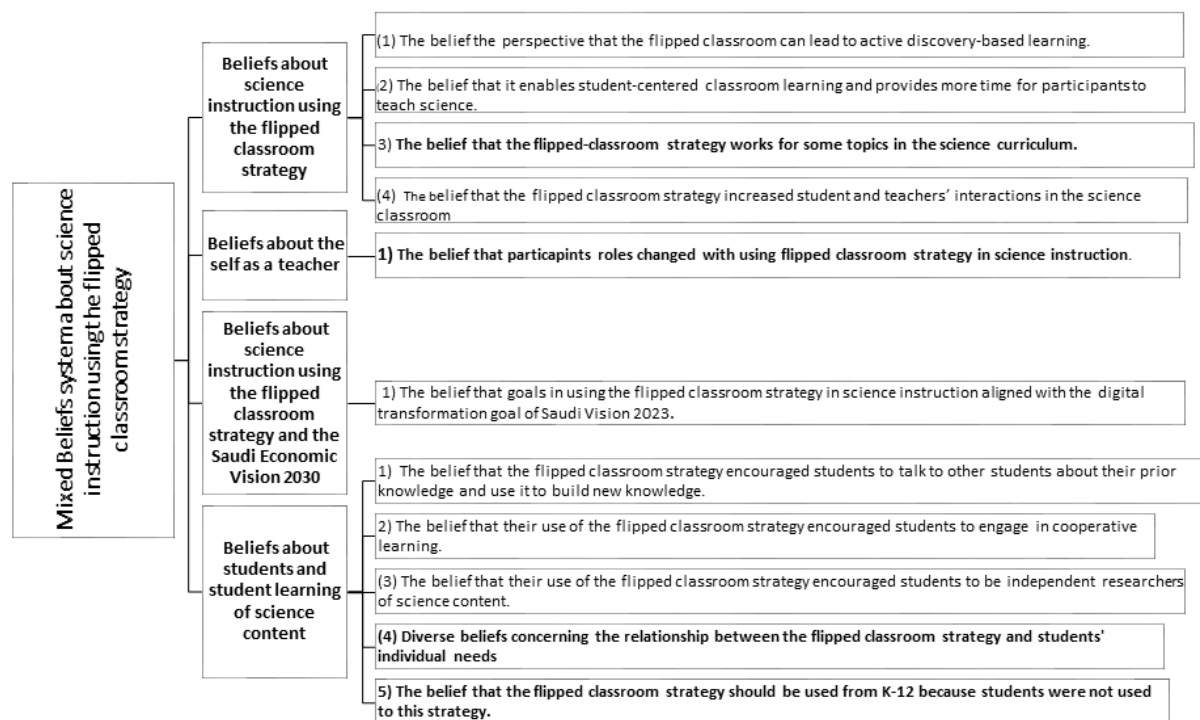


Figure 2. Mixed Beliefs

4. DISCUSSION

The findings show that participants in this study held a mix of beliefs—sometimes leaning toward student-centered approaches, and other times sticking with more traditional methods. This isn't unusual; previous research (Samuelowicz and Bain, 2001) found that participants often have mixed views. In this study, these mixed beliefs seemed to come from challenges like not having much experience with the flipped classroom, time constraints, and feeling that not all science topics are a good fit for this method. These hurdles may have made participants unsure about using the flipped classroom consistently. Other studies (Uzuntiryaki et al., 2010) also found that participants often use both old and new teaching styles at the same time.

Other research backs this up. For example, Kaymakamoglu (2018) found that participants' beliefs and their actual teaching don't always match up—probably because they have different, sometimes conflicting, beliefs. Dong et al. (2020) also pointed out that participants' beliefs and their use of technology influence each other. In this study, most participants were new to the flipped classroom, so their mixed beliefs might be due to a lack of experience. With more time using the flipped classroom, participants might grow more comfortable and consistent in their approach.

There are also real-world challenges that affect participants' beliefs. Large class sizes, spotty internet, and school policies can make it hard to fully use the flipped classroom (Al-Jaid, 2019). In this study, participants didn't have much experience with the flipped classroom, which might explain why they still held on to some traditional beliefs. Some participants felt that lectures were still needed for certain topics or that the flipped approach only worked for specific parts of science. This matches what Kaymakamoglu

(2018) found—participants often mix old and new teaching styles, even if they believe in student-centered learning.

These findings also make sense when you consider participants' backgrounds. Many participants said they grew up with traditional teaching and didn't have much exposure to technology in their own education. Some had taught for years using old methods before trying the flipped classroom. For instance, Warda had taught for over a decade before recently starting to use the flipped approach—so it's natural she might still lean toward traditional ways. This supports Pajares' (1992) idea that participants' beliefs are shaped by their own learning and teaching experiences.

Overall, the study found that participants' core beliefs were mostly about how they teach science and see themselves as participants. This isn't surprising—other research has shown that what participants believe plays a big role in how they teach. The results also highlight why professional development should focus not just on new methods, but on participants' beliefs as well. Training programs need to help participants connect their beliefs with the goals of Saudi Vision 2030 and give them time to adjust as they try new strategies like the flipped classroom.

These findings fit with bigger education reforms, like the Next Generation Science Standards (2013), which call for more active, student-driven science learning instead of just lectures. In this study, participants' main beliefs focused on how they teach science, while their ideas about students and reforms were secondary. So, professional development should help participants work on both their main teaching beliefs and these other, related beliefs to better support changes like those in Saudi Vision 2030.

5. CONCLUSION AND IMPLICATIONS

This study shows that participants are more likely to use the flipped classroom when they see real value in it and feel it matches bigger educational goals. It's important for participants to understand how the flipped classroom fits into Saudi Vision 2030 and why these changes matter. More research is needed on how the flipped classroom works in different subjects, since participants' views may depend on what they teach.

The findings also highlight how important it is for participants to think about their own roles—not just new teaching methods. While participants had clear ideas about the flipped classroom, they were less sure about their own professional identity. Training programs should help participants see how their roles are changing with new ways of teaching and technology.

Because of these results, it's recommended that the Saudi Ministry of Education design training that helps science teachers better understand and strengthen their professional roles. These programs should encourage teachers to reflect on their beliefs and teaching styles, especially as they try out new methods like the flipped classroom. Future research should also include teachers who have more experience with this approach to get a fuller picture.

Training for teachers shouldn't just cover how to use technology in general—it should also help them plan and create flipped lessons, like making good instructional videos. Since teachers know their students best, training should give them both the technical and teaching skills they need to create lessons that work for everyone. Step-by-step courses and workshops can help teachers use the flipped classroom approach more effectively and for the long term.

Some teachers said the flipped classroom was tough to use for certain science subjects, especially when there was a lot of material to cover. For example, a biology teacher worried about keeping up with the curriculum. Because of this, more research should look at how the flipped classroom works in specific subjects like Biology, Chemistry, and Physics. Future studies should also explore how teachers' existing beliefs interact with reforms and new teaching methods.

Overall, this study shows just how important teachers' beliefs are to making education reforms work. To meet the goals of Saudi Vision 2030, it's important to understand that teachers may have a mix of traditional and new ideas. Knowing where teachers stand can help design better training and make science education reforms more successful. As reforms move forward, those creating teacher training should

remember that teachers' beliefs are complex and always changing—not everyone will instantly adopt new ways of teaching.

Even though this study took place in Saudi Arabia, the results may also apply to other countries with similar school systems and reform goals, especially in the Middle East. Research like this helps the world better understand how science education is changing in different contexts. These findings may also encourage teachers everywhere to think about their own beliefs, their students' learning, and their own growth as educators.

Lastly, these results have lessons for curriculum developers. When adding the flipped classroom to science programs, it's important to listen to teachers and include their ideas in the design. Teachers know what really works in the classroom and can point out both strengths and challenges of new strategies. Working closely with teachers ensures that curriculum changes fit real needs and help meet the goals of Saudi Vision 2030.

6. LIMITATIONS

This study looked at the views of six science teachers working in a school setting shaped by Saudi Vision 2030. Because of this, the findings are based on these teachers' experiences and aren't meant to apply to every educational context. Still, researchers might find useful lessons by comparing this case with other places undergoing similar education reforms.

Future research should adopt broader approaches to identify the challenges teachers face when implementing the flipped classroom and how to address them. Long-term studies that follow teachers before and after they use flipped classrooms would also give a better understanding of how their beliefs change and how they adapt to new ways of teaching science.

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Research Ethics. This study received University of North Texas, Denton, ethics approval on 15 December 2022 (reference number: #IRB-22-728).

Data Availability Statement. All data can be obtained from Dr. Fahdah Alanazi.

Conflicts of Interest. The authors declare no conflicts of interest.

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