Teacher growth mindset and ICT integration in Indonesian classrooms: insights from in-service and preservice teacher programs

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Abstract
Purpose – This study explores the relationships among multiple factors, including growth mindset, lifelong learning and continuous professional development (CPD), influencing teachers’ integration of information and communication technology (ICT) into their teaching methods.

Design/methodology/approach – The study involved 1,095 Indonesian vocational high school teachers who participated in in-service or preservice teacher development programs. Data was collected through a survey, and a structural equation model with partial least squares parameter estimation was used to analyze the relationships and mediations.

Findings – Structural equation modeling revealed that a growth mindset positively affects both lifelong learning and CPD. Moreover, lifelong learning positively impacts CPD. Furthermore, all of these variables demonstrate a positive effect on teachers’ ICT integration in the classroom. The findings indicate that lifelong learning and CPD partially mediate the relationship between a growth mindset and ICT integration.

Originality/value – This study contributes to the literature on the determinants of teachers’ ICT usage postparticipation in in-service and preservice teacher programs. The findings underscore the significant impact of a growth mindset on teachers’ ICT use in the classroom.

Keywords Continuous professional development, Growth mindset, ICT integration, Lifelong learning

Paper type Research paper

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Ethics statement: This study was conducted in accordance with the Declaration of Helsinki and its later amendments or comparable ethical standards. The Ethics Committee of Fakultas Teknik Universitas Negeri Makassar approved the research protocol. Full ethical clearance was received from the said committee on February 23, 2023 under the Approval No. 1418/UN36.2/KP/2023. All the participants provided informed consent prior to their involvement in the study.
QAE

Introduction

Research indicates that incorporating information and communication technology (ICT) into education yields substantial educational and pedagogical advantages for both students and teachers (Jimoyiannis, 2009). Significant ICT integration in classrooms actively engages students, enriching their learning experiences (Adarkwah, 2021; Birch and Irvine, 2009). For teachers, this integration has the potential to boost confidence and competence in technology use, improve access to ICT resources and enhance classroom instruction and performance (Aksal and Gazi, 2015; Bingimlas, 2009). However, obstacles to ICT integration exist (Hew and Brush, 2006), particularly in developing countries, with faculty resistance to change being a notable challenge (Bingimlas, 2009).

Resistance to change is often associated with a fixed mindset (Moorman and Pomerantz, 2010; Nov and Ye, 2009). Conversely, a growth mindset, characterized by adaptability and creativity in problem-solving and stress management, is linked to teachers with more open attitudes (Claro et al., 2016) Anderson et al., 2021; Dweck and Yeager, 2019; Rissanen and Kuusisto, 2023). Furthermore, teachers’ mindsets influence their beliefs and actions toward students; those with a growth mindset are inclined to offer constructive feedback to facilitate students’ growth, development and learning from mistakes (Soleas and Hong, 2020).

Several studies examined the determinants of ICT integration in classrooms (Lai et al., 2012; Lai et al., 2018; Scherer et al., 2019; Venkatesh and Davis, 2000). Unfortunately, these studies have focused only on students. However, limited research has been conducted on ICT integration among teachers. The study conducted by Bayaga et al. (2021) included qualitative research to investigate the effects of faculty growth mindsets on their beliefs about preservice teachers’ ICT integration. It concluded that faculty of the preservice programs with a growth mindset believe that their preservice teachers will integrate ICT into their classrooms in the future. Another study by Bai et al. (2021) investigated the effect of a growth mindset on ICT integration in the classroom using teacher acceptance of technology and self-regulated learning as moderating variables. The current study focuses on growth mindset, self-efficacy and ICT anxiety.

Li et al. (2019) investigated the predictors of teachers’ use of technology in classrooms. Using a multilevel model, this study determined that teachers’ beliefs, attitudes toward technology and perceived training effectiveness significantly affected their ICT integration into the classroom. However, previous studies have not investigated motivations for joining ICT-related training. Motivations for joining ICT-related training can be encouraged by lifelong learning and continuous professional development (CPD).

This study investigated the determinants of teachers’ integration of ICT into the classroom after attending a teacher development program. In particular, it investigated the relationships between multiple factors, including a growth mindset, lifelong learning and CPD; and how these factors may work together to explain teachers’ ICT integration in the classroom. Recognizing the factors affecting teachers’ ICT adoption is crucial. This knowledge can be used to develop teacher-training programs that boost ICT use among teachers for educational purposes. Therefore, studies on growth mindsets, lifelong learning and professional development programs are required to offer a more detailed and accurate understanding of how to enhance teachers’ ICT use.

Lifelong learning plays a crucial role in encouraging teachers to develop professionalism and effectively address emerging educational needs and opportunities (Dunlap, 2008). Teachers should focus on professional development continuously throughout their careers because of the constant changes in their everyday contexts and the evolving nature of the field of education (Louws et al., 2017). Having access to CPD opportunities and engaging in
lifelong learning encourages career satisfaction, which promotes professional growth (Price and Reichert, 2017).

The current research is rooted in the Indonesian educational context, but the insights we have uncovered extend far beyond national borders. The predictors we investigated – lifelong learning, a growth mindset and CPD – are not confined to Indonesia. They represent universal attributes that underpin the success of modern education worldwide. We offer a microscopic view of the global educational landscape by delving into these factors in the Indonesian setting. Our findings not only shed light on how Indonesian teachers can harness ICT effectively but also have profound implications for educators worldwide.

**Hypothesis**

**Growth mindset**

A growth mindset is the understanding that personal traits such as cognitive capacities are not fixed and can be enhanced (Dweck 2006, 2017; Dweck and Yeager, 2019). A growth mindset refers to the belief that human capacities can be developed over time and that individuals can improve their abilities through effort and learning (Dweck and Yeager, 2019). This mindset is relevant to technology integration, as it promotes a positive attitude toward learning and adapting to new technologies.

Research suggests that individuals with a growth mindset believe that their abilities and skills can be developed through effort and practice, leading them to actively seek opportunities for learning and personal growth (Ronkainen et al., 2019). This mindset fosters the desire for challenge and resilience in the face of setbacks, as individuals with a growth mindset view challenges as opportunities for learning and improvement (Khajavy et al., 2020). Thus, we hypothesized the following:

**H1.** Teacher’s growth mindset positively affects their lifelong learning.

A growth mindset is pivotal in improving learning processes (Xu et al., 2021). Research conducted by Lin et al. (2022) found that teachers’ affective attributes such as growth mindset and self-efficacy are crucial components of their professional attitudes. Consequently, we hypothesize the following:

**H2.** Teacher’s growth mindset positively affects their continuous professional development.

Students with a growth mindset adapt to academic challenges and attain greater success than those with a fixed mindset (Frey et al., 2018). This approach can also be applied to teachers. Teachers who believe that their ICT skills are malleable are more likely to engage in continuous learning and professional development to improve their skills. They are more open to testing new technologies and strategies in the classroom, which can enhance ICT integration and teaching effectiveness (Alazam et al., 2012). Thus, we hypothesize:

**H3.** Teacher’s growth mindset positively affects their ICT integration in the classroom.

ICT use in classrooms stimulates teachers’ technological pedagogical content knowledge, which is related to their ICT competencies (Aslan and Zhu, 2017; Kabakci Yurdakul and Coklar, 2014). The integration of ICT into the classroom requires a commitment to lifelong learning and an appropriate environment because it requires continuous and autonomous learning (Artacho et al., 2020). Thus, we hypothesize:

**H4.** Teacher’s lifelong learning positively affects their ICT integration in the classroom.
Teachers prefer informal training methods such as blended learning in their professional development programs (Wastiau et al., 2013). These methods allow teachers to apply newly acquired ICT skills directly to their teaching practices, making training more relevant and effective (Wastiau et al., 2013). Adequate ICT competencies and classroom usage may be associated with the professional development of teachers. Thus, we hypothesized the following:

**H5.** Teacher’s professional development positively affects their ICT integration in the classroom.

Lifelong learning involves continuous learning and adapting to the changes that occur at different stages of life (Loads, 2007). It includes both planned educational programs within academic institutions and informal learning that happens spontaneously (Dindar and Bayrakci, 2015). Lifelong learning helps teachers adapt to new teaching methods, technologies and innovations, ultimately enhancing their effectiveness in the classroom (Louws et al., 2017). Having a lifelong-learning mindset can improve professional abilities (Delgado Bolton et al., 2022). Therefore, we hypothesized the following:

**H6.** Teacher’s lifelong learning positively affects their continuous professional development.

**Materials and methods**

A total of 1,095 teachers from a vocational high school in Indonesia participated in this study. The data collected in this research can be accessed at the following link: https://doi.org/10.6084/m9.figshare.23798364.v2. Most participants were in-service teachers (93.4%) who had completed the Indonesian teacher-training program over two semesters (one year). Table 1 presents the demographic variables of the participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Count</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>576</td>
<td>52.6</td>
</tr>
<tr>
<td>Female</td>
<td>519</td>
<td>47.4</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Indonesia</td>
<td>641</td>
<td>58.5</td>
</tr>
<tr>
<td>Eastern Indonesia</td>
<td>454</td>
<td>41.5</td>
</tr>
<tr>
<td><strong>Ages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than or equal to 25 years old</td>
<td>7</td>
<td>0.6</td>
</tr>
<tr>
<td>26–35 years</td>
<td>425</td>
<td>38.8</td>
</tr>
<tr>
<td>36–45 years</td>
<td>520</td>
<td>47.5</td>
</tr>
<tr>
<td>46–55 years</td>
<td>129</td>
<td>11.8</td>
</tr>
<tr>
<td>More than 55 years old</td>
<td>14</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Teacher education program</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preservice teacher program</td>
<td>72</td>
<td>6.6</td>
</tr>
<tr>
<td>In-service teacher program</td>
<td>1,023</td>
<td>93.4</td>
</tr>
</tbody>
</table>

Table 1. Demography of research participants

Source: Authors’ own work
Measures
The questionnaire comprised 43 items measuring the four variables. The details of the number of items for each variable are discussed in this section.

Preservice teacher information and communication technology competencies
The scale by Tondeur et al. (2017) was used to measure teacher ICT competencies in the classroom: competencies to support pupils for ICT use in class (Cronbach’s $\alpha = 0.94$) and competencies to use ICT for instructional design (Cronbach’s $\alpha = 0.89$). The reliability of the factors was regarded as adequate, as they ranged between 0.7 and 0.95 (Bonett and Wright, 2015). The study used the items that best fit the Indonesian context, comprising 12 items, with six items for each factor.

Growth mindset
The study measures teacher growth mindset using a growth mindset scale developed by Chen et al. (2021) comprising motivation, attitude, challenge, grit, adversity and positive mindset (Cronbach’s $\alpha = 0.911$). The total number of items in the original scale was 18 items. However, we reduced the number of items by selecting the items the best fit the context of our study, resulting in a nine-item growth mindset scale.

Lifelong learning
The lifelong learning was assessed using a lifelong learning questionnaire (Cronbach’s $\alpha = 0.71$) developed by Kirby et al. (2010). The questionnaire items were developed based on the five characteristics of lifelong learners identified by Knapper and Cropley (2000): goal-setting, application of knowledge and skills, self-direction and evaluation, locating information and adaptable learning strategies.

Continuous professional development
The CPD variable was measured using a self-developed questionnaire based on a questionnaire on CPD of nurses, the questionnaire measuring CPD of nurses (Q-PDN), developed by Brekelmans et al. (2015). The self-developed questionnaire focused on activities as factors of professional development. It comprised 11 items based on the teaching profession and expert judgment of teachers. Table 2 displays all items used in the study to measure all constructs in the model.

Data analysis
Structural equation modeling techniques with the partial least squares estimation method (PLS-SEM) were used to evaluate the mediating paths in the proposed models using the software package SmartPLS 3. Four variables were used in the model tests: growth mindset, lifelong learning, professional development and ICT integration (Figure 1). The PLS-SEM technique was used to assess two models: a measurement model and a structural model (Hair et al., 2021).

Results
Descriptive statistics and correlations
Table 3 presents the descriptive statistics of the variables and their correlations. The average participants’ responses were nearly seven for growth mindset ($M = 6.96$, $SD = 3.23$) and professional development ($M = 7.33$, $SD = 2.30$). A higher mean of responses was
<table>
<thead>
<tr>
<th>Code</th>
<th>Statements</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT1</td>
<td>I have a good ability to encourage students to use information and communication technology (ICT) in a good and correct way</td>
<td>Tondeur et al. (2017)</td>
</tr>
<tr>
<td>ICT2</td>
<td>I have a good ability to encourage students to use information and communication technology (ICT) critically</td>
<td></td>
</tr>
<tr>
<td>ICT3</td>
<td>I often create activities in learning that can increase students’ knowledge/ability in mastering technology</td>
<td></td>
</tr>
<tr>
<td>ICT4</td>
<td>I often help students to find information about ICT</td>
<td></td>
</tr>
<tr>
<td>ICT5</td>
<td>I often help students to process and organize the information they get with ICT</td>
<td></td>
</tr>
<tr>
<td>ICT6</td>
<td>I often help students to present information using information technology</td>
<td></td>
</tr>
<tr>
<td>ICT7</td>
<td>I always teach students to use ICT in a safe, responsible and effective way</td>
<td></td>
</tr>
<tr>
<td>ICT8</td>
<td>I encourage students to collaborate/group work using ICTs</td>
<td></td>
</tr>
<tr>
<td>ICT9</td>
<td>I can select ICT applications that are appropriate to specific learning models, strategies and techniques</td>
<td></td>
</tr>
<tr>
<td>ICT10</td>
<td>I have good skills in using ICT to communicate with students</td>
<td></td>
</tr>
<tr>
<td>ICT11</td>
<td>I can design the learning environment by using the existing infrastructure at school</td>
<td></td>
</tr>
<tr>
<td>ICT12</td>
<td>I can select appropriate ICT applications to create a conducive learning environment for students</td>
<td></td>
</tr>
<tr>
<td>GROW1</td>
<td>I enjoy learning new things to increase my knowledge, satisfy my curiosity and improve my ability to teach in the classroom</td>
<td>Chen et al. (2021)</td>
</tr>
<tr>
<td>GROW2</td>
<td>I think that no matter how hard I study, my abilities will not develop much, including my IQ and intelligence</td>
<td></td>
</tr>
<tr>
<td>GROW3</td>
<td>I think IQ and talent can still be improved by continuing to study and work hard</td>
<td></td>
</tr>
<tr>
<td>GROW4</td>
<td>I am known as a person who likes challenges, is not afraid of failure, does not care what others say and is not easily discouraged in solving problems</td>
<td></td>
</tr>
<tr>
<td>GROW5</td>
<td>I am a person who has a great curiosity that makes me always try new things</td>
<td></td>
</tr>
<tr>
<td>GROW6</td>
<td>I like to work hard because I believe it can bring positive benefits</td>
<td></td>
</tr>
<tr>
<td>GROW7</td>
<td>I like it when other people criticize me because then I can improve myself</td>
<td></td>
</tr>
<tr>
<td>GROW8</td>
<td>I do not like challenges because my brain is already hard to think with</td>
<td></td>
</tr>
<tr>
<td>GROW9</td>
<td>I feel that people who criticize me are often wrong and do not want to be criticized back</td>
<td></td>
</tr>
<tr>
<td>LONG1</td>
<td>I prefer to learn things that have been organized by certain people/institutions</td>
<td>Kirby et al. (2010)</td>
</tr>
<tr>
<td>LONG2</td>
<td>I can deal well with unexpected things</td>
<td></td>
</tr>
<tr>
<td>LONG3</td>
<td>I am not comfortable with uncertainty</td>
<td></td>
</tr>
<tr>
<td>LONG4</td>
<td>I am able to see the wisdom behind things that others see as mistakes/irregularities</td>
<td></td>
</tr>
<tr>
<td>LONG5</td>
<td>I rarely think about what I should learn next and how to improve my knowledge</td>
<td></td>
</tr>
<tr>
<td>LONG6</td>
<td>I feel that I am a person who can independently determine what I need to learn to be a good teacher</td>
<td></td>
</tr>
<tr>
<td>LONG7</td>
<td>I enjoy learning new things</td>
<td></td>
</tr>
</tbody>
</table>

(continued)
I like to relate my knowledge about classroom management to the practical situation. When I learn something new, I always relate it to my existing knowledge. I feel that whatever I learn, I should be able to understand it well.

Teacher’s continuous professional development (CPD)

CPD1 I often actively participate in research training related to education
CPD2 I often read education research articles
CPD3 I have conducted research at school, either classroom action research, experiments or other types of research
CPD4 I have written articles in various media, both popular writing and research results
CPD5 I often attend short-term training (2–8 h)
CPD6 I often inform the principal when there is something that can be done to improve the teaching performance of teachers at school
CPD7 I diligently follow the development of pedagogy including learning technology, curriculum and other matters
CPD8 I always reflect back on my performance after the learning process is over
CPD9 I evaluate the things that I can maintain and improve in the learning process in the classroom
CPD10 I actively participate in teacher groups (MGMP/KKG)
CPD11 I always want to hear good practices in classroom learning from other teachers
CPD12 I always share good practices of classroom learning with fellow teachers

Source: Authors’ own work
observed for lifelong learning ($M = 7.52, SD = 2.37$), whereas ICT use ($M = 8.31, SD = 1.37$) displayed the highest response mean.

The correlations between the variables as underlying statistics for multivariate analysis (PLS-SEM) indicated that a growth mindset had a positive significant association with lifelong learning ($r = 0.595, p < 0.001$), teacher professional development ($r = 0.453, p < 0.001$) and ICT usage in the classroom ($r = 0.478, p < 0.001$). Moreover, lifelong learning had similar relationships with teacher professional development ($r = 0.586, p < 0.001$) and ICT usage in the classroom ($r = 0.561, p < 0.001$). The correlation between teacher professional development and ICT usage in the classroom was also statistically significant ($r = 0.646, p < 0.001$).

**Structural equation modeling**
The PLS-SEM approach was used to evaluate the reliability and validity of the items and constructs (Sarstedt et al., 2019, 2020). The constructs used in this study were modified versions of the original scales, and their reliability and validity were investigated. Table 4 presents the reliability and validity of the scale.

The measurement model indicated that all constructs, as evidenced by the Cronbach’s alpha values, were greater than 0.7. These statistics confirm that the model and its
constructs meet the standards set for confirmatory research, as outlined by Hair et al. (2019). In addition, the constructs indicated acceptable convergent validity as demonstrated by their ability to explain over half the variance in their respective indicators, as measured by the average variance extracted values. Importantly, the heterotrait-monotrait coefficients consistently fell below 0.85, thereby illustrating a definite separation among all the constructs analyzed (Henseler et al., 2015). Thus, the constructs used in this study are valid because they accurately measure what they intend to do, are reliable and produce consistent outcomes.

Table 5 demonstrated that teachers’ growth mindsets affect their lifelong learning, CPD and ICT integration in the classroom. The analysis confirmed this hypothesis. Teachers’ growth mindset significantly affected their lifelong learning ($\beta = 0.809, p < 0.001$), CPD ($\beta = 0.168, p < 0.001$) and ICT integration in the classroom ($\beta = 0.426, p < 0.001$). Based on Cohen’s benchmark (Cohen, 2013), the size of the effect of teachers’ growth mindset was strong ($f^2 = 1.898$) on their lifelong learning, and weak on their CPD ($f^2 = 0.022$) and ICT integration in the classroom ($f^2 = 0.148$).

This framework states that lifelong teacher learning affects CPD and ICT integration in the classroom. The results provide sufficient evidence to support the framework by indicating that teacher lifelong learning significantly influenced and encouraged their CPD ($\beta = 0.599, p < 0.001$) and their ICT integration ($\beta = 0.111, p = 0.042$). The effect size of lifelong teacher learning was moderate for CPD ($f^2 = 0.276$) and small for ICT integration in the classroom ($f^2 = 0.008$).

Moreover, the teachers’ CPD supported this research framework. CPD significantly affected teachers’ ICT integration in the classroom ($\beta = 0.308, p < 0.001$). The effect size of teachers’ CPD on ICT integration was small ($f^2 = 0.103$). As the direct effect of a growth mindset
mindset on ICT integration was significant, lifelong learning and CPD partially mediated this relationship.

**Mediation analysis**
Mediation analysis was used to describe the indirect effect of a growth mindset on the intention to use ICT in the classroom. The analysis provided specific paths linking growth mindset and teachers’ ICT usage in the classroom. Table 6 shows the specific paths from a growth mindset to teachers’ ICT usage.

In the analysis using the bootstrapping method, a growth mindset indicated a significant and positive effect on teacher intention to use ICT in the classroom through lifelong learning ($\beta = 0.089$, $p = 0.041$). Similar results were also displayed by CPD ($\beta = 0.052$, $p < 0.001$). However, the highest mediation effect was demonstrated by the full path between growth mindset and ICT usage which included lifelong learning and CPD ($\beta = 0.149$, $p < 0.001$).

**Discussion**
This study explored the potential effects of a growth mindset and ICT integration in Indonesian teachers’ classrooms. Moreover, it investigated the mediating role of lifelong teacher learning and professional development in the relationship between a growth mindset and ICT integration. The findings underscore the significant effects of a growth mindset and ICT integration in classrooms.

When teachers are convinced that they can enhance their ICT proficiency (referred to as having a growth mindset), they acknowledge that learning is useful (Blackwell et al., 2007). Consequently, they are likely to display heightened involvement in the process of acquiring and incorporating ICT skills irrespective of their initial aptitude (Bai et al., 2021).

Teachers with a growth mindset are more likely to have positive attitudes toward ICT usage and believe in the potential of technology to enhance teaching and learning (Belay et al., 2020). They are more open to learning new skills and willing to invest the time and effort required to effectively integrate ICT into their instructional practices (Simangunsong, 2020). This mindset also extends to their learning, as they are more open to trying new teaching strategies and approaches, reflecting on their practices, and continuously improving their skills (Ronkainen et al., 2019).

The results indicate that teachers’ growth mindsets enhance lifelong learning. A recent study (Myers et al., 2016) discovered a correlation between growth mindset and connectivity of the ventral and dorsal striatal and the dorsal anterior cingulate cortex (ACC). The dorsal ACC and the dorsolateral prefrontal cortex (DLPFC) play crucial roles in error monitoring and behavioral adaptation. This study found a strong association between a growth mindset and the connectivity of the dorsal and ventral striatal, as well as the DLPFC. A growth mindset encourages lifelong learning (Ng, 2018).

<table>
<thead>
<tr>
<th>Indirect path to ICT integration</th>
<th>Path coef.</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM $\rightarrow$ LLL $\rightarrow$ ICT</td>
<td>0.089</td>
<td>2.046</td>
<td>0.041</td>
</tr>
<tr>
<td>GM $\rightarrow$ CPD $\rightarrow$ ICT</td>
<td>0.052</td>
<td>3.460</td>
<td>0.001</td>
</tr>
<tr>
<td>GM $\rightarrow$ LLL $\rightarrow$ CPD $\rightarrow$ ICT</td>
<td>0.149</td>
<td>7.248</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**Table 6.** Specific indirect effect as mediation analysis

**Notes:** GM = growth mindset; LLL = lifelong learning; CPD = continuous professional development; ICT = ICT integration in the classroom

**Source:** Authors’ own work
Furthermore, the results indicated that teachers’ growth mindsets play a significant role in advancing their professional development. Teachers possessing a growth mindset consistently adopt an attitude of “I’m not yet.” They provide sincere constructive criticism of their evolving selves, bolstering their ability to overcome the obstacles they encounter in their teaching careers (Lin et al., 2022). Teachers with a growth mindset often prioritize understanding students’ learning methods and incorporating teaching strategies (Rissanen et al., 2019). Consequently, teachers with a growth mindset tend to enhance their self-confidence in using effective teaching strategies (Fackler and Malmberg, 2016).

Individuals with a growth mindset posit that their abilities and intelligence can be developed through effort and practice (Blackwell et al., 2007; Zhao et al., 2018). This belief fosters a higher sense of control and autonomy as individuals view attributes as malleable through effort (Dweck and Leggett, 1988). Consequently, individuals with a growth mindset tend to have more autonomous motivations and are more willing to make the necessary efforts to improve their skills (Deci and Ryan, 1985). These characteristics encourage teachers to develop their profession-related skills continuously.

In addition, the results underscore the fact that teachers’ lifelong learning is a powerful driver of CPD. Lifelong learning encourages teachers’ professional development by motivating them to develop their instructional skills. The motivation to develop instructional skills plays a crucial role in professional development, influencing teachers’ engagement in professional development programs and their implementation of new practices (Andersson and Palm, 2018).

Lifelong learning refers to the continuous acquisition of knowledge, skills and competencies throughout life beyond formal education (Jones et al., 2016; Khuc, 2020). Lifelong learning affects individuals’ motivation to develop skills in several ways. First, they promote adaptability and flexibility when faced with evolving demands and challenges. It enables individuals to acquire the skills required to navigate changing work environments (Schultheiss and Backes-Gellner, 2023). Second, they contribute to personal growth and self-esteem. By engaging in learning activities and acquiring new skills, individuals experience a sense of accomplishment and fulfillment (Tatik and Aycicek, 2022). Third, they are closely linked to career advancement and professional development. Acquiring new skills and knowledge can open doors to new opportunities, promotions and increased job satisfaction (Park et al., 2016). Finally, lifelong learning is driven by intrinsic motivation and the desire for personal fulfillment. This allows individuals to pursue their passions, interests and curiosities, leading to a sense of purpose and satisfaction (Park et al., 2016).

Mediation effect of lifelong learning and professional development
The research framework considers lifelong learning and professional development as mediating variables. The findings revealed that lifelong learning and professional development partially mediated the relationship between teachers’ growth mindsets and ICT integration in the classroom. Lifelong learning significantly affects the integration of ICT into classrooms. ICT motivation affects teachers’ ICT integration of ICT into the classroom (Mubarak Al-Awidi and M Aldhafeeri, 2017). Teachers’ sense of autonomy and competence plays a significant role in their motivation to learn about ICT use (de Brabander and Glastra, 2021). Lifelong learning promotes autonomy by enabling individuals to control their learning processes, make informed decisions and develop self-directionality (Benson, 2007). This empowers learners to become active participants in their learning and fosters a sense of ownership and responsibility for their educational journey (Tekkol and Demirel, 2018). Through lifelong learning, individuals develop the skills and mindsets necessary to engage in self-assessment, reflect on their learning progress and set goals for continuous improvement (Baleghizadeh and Masoun, 2014).
Conclusion
This cross-sectional study investigated the determinants encouraging teachers to use ICT in classrooms. These findings provide evidence that a growth mindset is significantly related to ICT integration in classrooms. This relationship was partially mediated by lifelong learning and CPD.

Considering the finding that a growth mindset significantly influences teachers’ ICT integration in the classroom, it is evident that fostering a growth mindset should be integral in teacher-training programs. Teacher-training institutions and educational authorities should prioritize strategies to instill and nurture a growth mindset among educators. This may involve workshops, seminars and professional development sessions explicitly designed to promote belief in the potential for improvement through effort and learning from failure. Moreover, integrating growth mindset principles into the curriculum and pedagogical approaches to teacher-training programs can be instrumental. Encouraging self-reflection and willingness to embrace challenges amid rapidly evolving technology can equip teachers with the resilience and adaptability required for successful ICT integration. Emphasizing the significance of lifelong learning and CPD, teacher training can serve as a valuable mediator in bridging the gap between adopting a growth-oriented mindset and effectively utilizing ICT in educational settings. By nurturing a growth culture among educators, we can prepare them to embrace innovation and adapt to the ever-changing demands of modern classrooms.

Limitations
This study has some design-related limitations. The use of a cross-sectional approach, susceptible to common method bias (Spector, 2019), hinders the determination of causal relationships. This study also used convenience sampling, which may have introduced bias. In addition, restricting participants to vocational high school teachers limits the generalizability of results to other school types. Further studies should use a longitudinal design for investigating cause-and-effect relationships and use probability sampling to mitigate potential biases.

Future work
There are several promising avenues for future research that can expand the findings of this study. First, investigating specific strategies and interventions within teacher-training programs that effectively foster a growth mindset and enhance ICT integration could yield valuable insights. Identifying best practices in this regard can offer practical guidance to teacher-training institutions and policymakers. Second, it is crucial to examine the long-term effects of a growth mindset on teachers’ professional development and sustained ICT integration in the classroom. Future studies should explore how educators with a growth mindset continually adapt and evolve in response to evolving technological and educational needs.

References
Teacher growth mindset


