

Exploratory Factor Analysis of the Malaysian Geography Teachers' Professionalism Questionnaire Instrument

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Abstract

This study aimed to develop and validate the Malaysian Geography Teachers' Professionalism Questionnaire Instrument based on the 2027 School Curriculum Framework. The instrument was designed to measure four key dimensions of geography teachers' professionalism: pedagogical practice, content mastery, assessment implementation, and character education. A quantitative survey design was employed involving 300 secondary school geography teachers in Malaysia. Respondents were selected using proportional stratified sampling and simple random sampling. The questionnaire consisted of 60 items, with 15 items representing each construct. Content validity was established through expert review, while construct validity was examined using exploratory factor analysis. The results indicated that the data were suitable for factor analysis, with a Kaiser-Meyer-Olkin value of .937 and a significant Bartlett's test of sphericity. Four factors were extracted, explaining 49.161% of the total variance. Most items recorded acceptable factor loadings ranging from .342 to .807, supporting the construct validity of the instrument. One item with a loading below .30 was retained provisionally based on theoretical relevance and expert judgment. Overall, this study provides preliminary evidence of the construct validity of the Malaysian Geography Teachers' Professionalism Questionnaire through exploratory factor analysis. Further validation using confirmatory factor analysis with an independent sample is recommended before the instrument is widely adopted.

Keywords: Geography Teacher Professionalism, Exploratory Factor Analysis, Instrument Development, Construct Validity, The 2027 School Curriculum.

Received: 26 April 2026

Revised: 17 June 2026

Published: 31 August 2026

1. Introduction

The changing landscape of education today demands that teachers have more comprehensive professionalism, especially in the aspects of pedagogy, content mastery, assessment, and student value formation. In the Malaysian context, the 2027 school curriculum emphasizes learning that is more meaningful, integrated, and relevant to the future needs of students (Malaysia, 2023). This change has direct implications for the role of teachers because teachers are not only responsible for delivering subject content but also need to plan learning experiences that can build students' knowledge, skills, values, and character holistically. In this regard, teacher professionalism needs to be understood as a broad and dynamic construct, encompassing teachers' ability to master content, choose appropriate pedagogical strategies, implement meaningful assessments, and shape students' character through teaching.

In geography education, teacher professionalism has its own importance because this subject is closely related to the understanding of space, place, the environment, human relationships with nature, and local and global issues, as well as decision-making skills based on geographical information. Larsen et al. (2020) emphasize that 21st-century geography education needs to develop geographic literacy, spatial thinking, and students' ability to understand the world critically. Seow et al. (2019) also emphasized that fieldwork-based inquiry is an important pedagogy in geography education because it connects classroom learning with real-world experiences in the field. Therefore, geography teachers need

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professional competencies in knowledge mastery, active and contextual teaching, self-efficacy, personality, communication skills, and effective teaching practices (Hassan et al., 2023; Shuib et al., 2020).

Geography teacher professionalism can also be understood through the teacher's knowledge framework. Shulman (1987) explains that quality teaching requires teachers to combine content knowledge, pedagogy, and the ability to transform lesson content into a form that can be understood by students. Ball et al. (2008) expand this discussion by emphasizing that content knowledge for teaching is not simply mastery of facts but involves the specific knowledge that teachers use to explain concepts, select examples, identify student misunderstandings, and make pedagogical decisions. In the context of geography, this framework is important because teachers need to teach complex concepts such as human-nature interactions, urbanization, physical Earth changes, sustainability, maps, and geospatial technology.

In addition to content and pedagogy mastery, assessment is also an important dimension in the professionalism of geography teachers. Black & Wiliam (2018) emphasized that classroom assessment should be seen as part of pedagogy because good assessment can shape the way teachers teach, provide feedback to students, and support learning. In geography, assessment should not be limited to mastery of facts but should assess students' skills in interpreting maps, analyzing graphs, conducting fieldwork, reflecting, and connecting geography knowledge to real situations. Therefore, geography teacher professionalism instruments need to include the assessment dimension so that the role of teachers as evaluators of learning can be measured more comprehensively.

Character education is also relevant in geography education because the content of this subject touches on issues of values, humanity, the environment, civic responsibility, and national identity. Lickona (1997) explains that teachers play an important role in character education through moral examples, classroom culture, teaching values through the curriculum, cooperative learning, and ethical reflection. In the context of geography, character education can be applied through discussions about environmental sustainability, empathy for humanitarian issues, patriotism, responsibility towards the community, and awareness of the impact of human actions on nature. Therefore, the professionalism of geography teachers needs to include the ability to integrate values explicitly and implicitly in teaching.

Although there are many studies on geography pedagogy, content knowledge, assessment, and character education, there is still a need to develop instruments that specifically measure geography teacher professionalism in the Malaysian context. Previous studies such as Hanifah et al. (2019) show that the pedagogical and professional competence of geography teachers is an important aspect of teaching effectiveness, while Rawlings Smith & Rushton (2023) emphasized that studies on the pedagogical content knowledge of geography teachers still require more systematic research. Therefore, this study developed and validated the Malaysian Geography Teacher Professionalism Questionnaire Instrument based on four main domains, namely pedagogical practices, content mastery, assessment implementation, and character education.

The novelty of this study lies in the development of a subject-specific professionalism instrument for geography teachers in Malaysia. Unlike general teacher professionalism instruments, this questionnaire integrates four geography-related professional domains, namely geography pedagogy, geography content mastery, assessment in geography teaching and learning, and character education through geography. This instrument is also contextually aligned with the Malaysian 2027 School Curriculum Framework, which emphasizes meaningful learning, holistic student development, values, and future-oriented competencies.

1.1. Objectives

- a) Building a Malaysian Geography Teacher Professionalism Questionnaire Instrument based on the 2027 School Curriculum Framework
- b) Examining the preliminary factor structure and construct validity evidence of the Malaysian Geography Teacher Professionalism Questionnaire Instrument using Exploratory Factor Analysis (EFA).

2. Literature Review

Teacher professionalism refers to the ability of teachers to carry out educational tasks in a knowledgeable, reflective, responsible, and effective manner. In the context of teaching, professionalism not only refers to the competence in delivering the content of the lesson but also involves the ability of teachers to plan learning, understand the needs of students, master the content, choose pedagogical strategies, carry out assessment, and form values. A professional teacher needs to have strong content knowledge, pedagogical knowledge that is appropriate to the subject discipline, and the ability to connect the two in the context of actual teaching (Ball et al., 2008; Rawlings Smith & Rushton, 2023;

Shulman, 1987). In geography education, this means that teachers need to understand the concept of geography and at the same time be able to process it through teaching strategies that are suitable for students to be translated into the teaching and learning process in the classroom.

Previous instruments and measures related to teacher professionalism have generally focused on broad dimensions of teaching competence, professional behaviour, occupational professionalism, professional awareness, professional practice, and teacher development. For example, İlğan et al. (2015) developed the Teacher Professionalism Scale to measure the professionalism level of teachers, while Yılmaz & Altinkurt (2014) developed the Occupational Professionalism of Teachers Scale to determine teachers' occupational professionalism levels. In addition, Tschannen-Moran (2009) examined teacher professionalism in schools using a subscale of the School Climate Index. However, these instruments and measures are generally not specifically designed for geography teachers and may not fully capture the disciplinary nature of geography education, such as spatial thinking, fieldwork, map skills, Geographic Information Systems (GIS), environmental issues, and human-environment relationships. Therefore, a more context-specific instrument is needed to measure geography teachers' professionalism in the Malaysian secondary school context.

Pedagogical practice is a key dimension in the professionalism of geography teachers because the quality of teaching depends largely on how teachers construct students' learning experiences. Joyce et al. (2000) emphasize that effective teaching models need to help students actively construct knowledge, while Seow et al. (2019) show that fieldwork and inquiry are important pedagogies in geography because they allow students to understand concepts through real-world experiences. Lee et al. (2022) also emphasized that the inquiry approach in the geography curriculum can strengthen students' skills in asking questions, investigating, and constructing explanations for geographical phenomena. This indicates that effective geography pedagogy should involve active learning, inquiry, fieldwork, project-based learning, case studies, group activities, and the use of visual materials.

Mastery of geography content is the foundation of teacher professionalism because teachers need to understand geography concepts, facts, processes, and issues before being able to convey them accurately to students. Ball et al. (2008) explain that content knowledge for teaching involves the teacher's ability to select examples, organize explanations, and identify student misunderstandings. In the context of geography, Rawlings Smith & Rushton (2023) emphasize that the pedagogical content knowledge of geography teachers involves the relationship between disciplinary knowledge, teaching strategies, and understanding of students. This is in line with Hanifah et al. (2019), which shows that the professional and pedagogical competence of geography teachers in Malaysia is important to ensure effective teaching of this subject. Therefore, the mastery of the content in this instrument includes aspects of topographic maps, weather and climate, physical processes of the earth, urbanization, migration, energy resources, ecosystems, and GIS as well as human relationships with the environment.

Technological advances have also expanded the needs for the professionalism of geography teachers, particularly in the use of data, digital maps, GIS, and visual materials. Lateh & Muniandy (2010) explained that GIS has great potential in the teaching and learning of geography because it can help students understand the concepts of space, location, and geographic data, although its implementation requires skills and resource support. Koehler & Mishra (2009) also emphasized that teachers need to integrate technological, pedagogical, and content knowledge to make teaching more effective. The synthesis of these two views shows that today's geography teachers need to not only master traditional content but also be able to use technology and visual materials such as maps, graphs, photos, charts, landscape images, and GIS in teaching.

The implementation of assessment is an important dimension because teacher professionalism is incomplete without the ability to meaningfully assess student learning. Black & Wiliam (1998) emphasizes that classroom assessment has a direct relationship with pedagogy because it helps teachers understand student development and adapt teaching. In the context of geography, assessment can be implemented through project assignments, fieldwork, map analysis, graph interpretation, presentations, reflections, and real-life situation-based assignments. (Ghani & Adnan, 2015) emphasize that educational assessment needs to assess student development more comprehensively, including cognitive, skill, and affective aspects. Therefore, the assessment dimensions in this instrument include formative assessment, rubrics, feedback, project assignments, online assessment, and holistic assessment.

Character education in geography is important because this subject provides ample space to discuss values, identity, the environment, community, and human responsibility towards the living space. (Lickona, 2004) emphasizes that teachers play the role of moral models, value guides, and classroom culture builders that support character development. Smith (1978) also sees geography as a field related to teaching social values because its content often involves questions of people, places, resources, and spatial justice. Cowie (1978) also emphasized that geography is a subject full of values because students are exposed to environmental issues, development, society, and human relationships with the

environment. This synthesis shows that character education in geography can be applied through issues of sustainability, empathy for humanity, patriotism, civic responsibility, integrity, and moral awareness.

In the context of instrument development, item construction needs to be done systematically so that each construct being measured has a clear theoretical basis and content. DeVellis (2017) emphasized that instrument development should begin with construct determination, item construction, expert review, and empirical analysis. Lawshe (1975) also emphasized that expert evaluation is important to determine whether an item is truly relevant and important to represent the study construct. In addition, Saputra et al. (2021) showed that the evaluation of questionnaire instruments should consider validity and reliability to ensure the quality of the instrument. The synthesis of these two references shows that instrument development cannot rely solely on statistical findings but must take into account content validity, theoretical relevance, and expert judgment. Therefore, in this study, the construction of the Malaysian Geography Teacher Professionalism Questionnaire Instrument was carried out based on four domains that have been identified through literature, curriculum documents, and expert review.

To validate the instrument construct, Exploratory Factor Analysis, or EFA, was used because this method is suitable for identifying the factor structure underlying questionnaire items. Hair Jr. et al., (2019) explained that EFA allows researchers to explore the relationships between items and determine whether items cluster according to certain factors. Tabachnick & Fidell (2019) also emphasized that EFA is suitable for use when researchers want to understand the internal structure of an instrument. Costello & Osborne (2005) also stated that EFA is very useful in scale development, especially when researchers want to determine the structure of the construct based on empirical data. Therefore, the use of EFA in this study is in line with the objective of validating the construct of the geography teacher professionalism instrument.

Based on the reviewed literature, this study conceptualizes geography teacher professionalism as a multidimensional construct consisting of four interrelated domains: pedagogical practice, content mastery, assessment implementation, and character education. Pedagogical practice represents teachers' ability to implement active and contextual geography teaching. Content mastery reflects teachers' understanding of geographical concepts and skills. Assessment implementation refers to teachers' ability to assess students' knowledge, skills, values, and application of geography in real-life contexts. Character education represents teachers' role in integrating values, civic responsibility, patriotism, and environmental awareness through geography teaching.

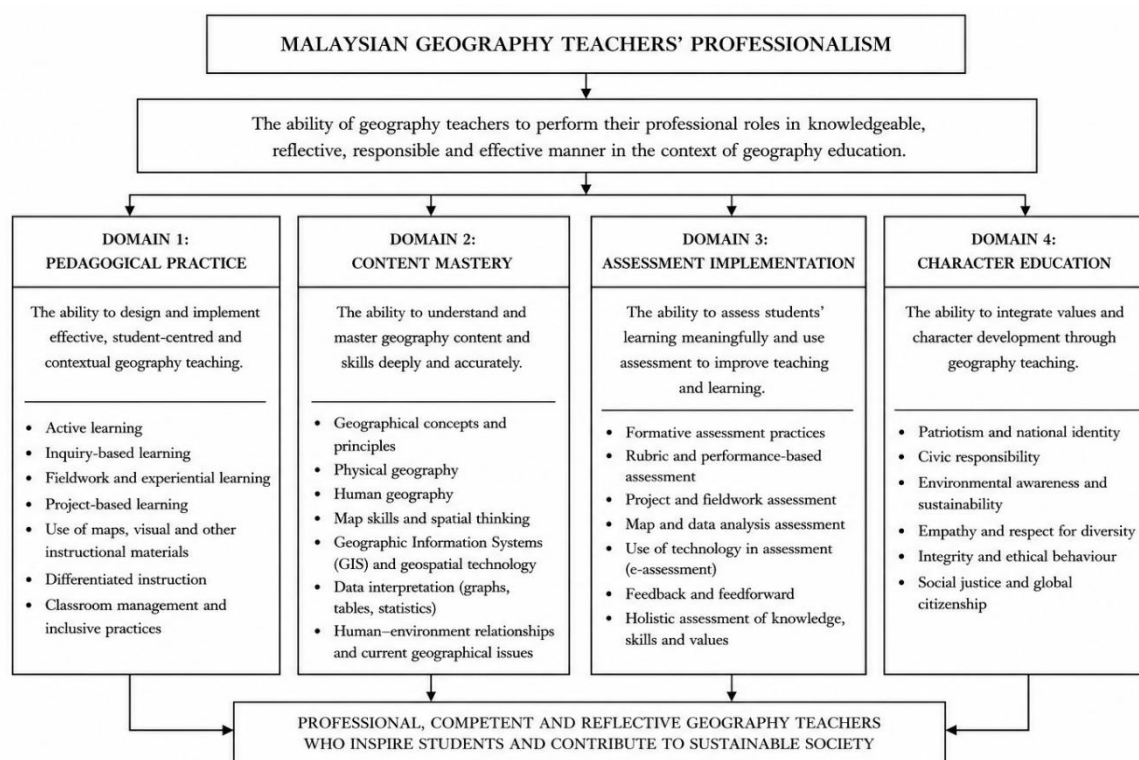


Figure 1. Conceptual Framework of Malaysian Geography Teachers' Professionalism.

Overall, the literature shows that the professionalism of geography teachers needs to be assessed through a multidimensional framework that combines pedagogy, content mastery, assessment, and character education. Therefore, the development of the Malaysian Geography Teacher Professionalism Questionnaire Instrument is significant because this instrument brings together all four dimensions in a measurement framework that is appropriate to the context of geography education and the requirements of the 2027 school curriculum.

3. Methods

This study uses a quantitative approach with a survey design. This design was chosen because the study aimed to develop the Malaysian Geography Teacher Professionalism Questionnaire Instrument and examine its preliminary factor structure and construct validity evidence using Exploratory Factor Analysis (EFA). EFA is suitable for use in instrument development because this method allows researchers to identify the factor structure underlying the questionnaire items as well as assess the construct validity of the developed instrument (Hair Jr. et al., 2019; Tabachnick & Fidell, 2019). This study focuses on four main domains of geography teacher professionalism, namely geography teaching pedagogy, geography content knowledge, assessment in the teaching and learning of geography, and character education in the teaching of geography.

The research instrument in the form of a questionnaire was developed based on a review of literature related to teacher professionalism, geography education, pedagogy, content knowledge, assessment, and character education. According to DeVellis (2017), instrument development should begin with the determination of a clear construct, the construction of items that represent the construct, expert review, and empirical analysis. This instrument uses a five-point Likert scale to measure the level of agreement of respondents with each item. Before being used in the actual study, the content validity of the instrument was carried out through expert review to assess the clarity of language, construct suitability, content accuracy, and item relevance to the context of geography teacher professionalism. According to Lawshe (1975), content validity involves expert judgment on the importance and relevance of an item to measure the study construct. Therefore, the decision to retain or drop an item does not depend solely on statistics but also takes into account theoretical fit, content relevance, and expert opinion (DeVellis, 2017).

The study population consisted of 10,631 secondary school geography teachers in Malaysia (Malaysia, 2025). The sample size of 300 respondents also produced a respondent-to-item ratio of 5:1 for the 60-item instrument. This ratio is considered acceptable for exploratory factor analysis, particularly when supported by a high KMO value and a significant Bartlett's Test of Sphericity. Nevertheless, future research should use a larger and independent sample to conduct confirmatory factor analysis. The study sample is selected from the population to answer the questionnaire instrument developed. In EFA studies, an adequate sample size is important to ensure that the factor structure formed is stable and interpretable. Hair Jr. et al. (2019) explained that a larger sample size can increase the stability of the factor solution, while Tabachnick & Fidell (2019) stated that a sample of around 300 respondents is usually considered good for factor analysis. This study used stratified proportional sampling and simple random sampling. Stratified proportional sampling was used to ensure that geography teachers from each state in Malaysia were represented equally. According to Creswell & Creswell (2018), stratified sampling is appropriate when the population has specific subgroups and the researcher wants to ensure that each subgroup is represented in the sample. After the number of respondents for each stratum is identified, simple random sampling is used to select respondents within each stratum.

The study data were collected using a questionnaire distributed to selected secondary school geography teachers as respondents. Respondents answered items based on their experiences, practices, and perceptions of geography teacher professionalism. Before the analysis was conducted, the data was screened to ensure that the responses were complete, consistent, and suitable for analysis. Preliminary data checks are essential before multivariate analysis to ensure that the data meets the basic requirements of the analysis (Hair Jr. et al., 2019).

Data analysis was conducted using exploratory factor analysis to assess the construct validity of the instrument. The extraction method used was principal component analysis (PCA), while the rotation method was Varimax with Kaiser normalization. Factor rotation was used to produce a clearer and easier-to-interpret factor structure (Hair Jr. et al., 2019). Since this study was exploratory in nature, PCA with Varimax rotation was used to identify the initial factor structure of the instrument. However, because the four constructs of teacher professionalism may be theoretically related, future studies are recommended to compare the solution with Principal Axis Factoring and oblique rotation methods such as Promax. This would provide a more robust understanding of the latent construct structure. Before EFA was conducted, data suitability was assessed using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)

and Bartlett's Test of Sphericity. According to Kaiser & Rice (1974) values above .60 are considered adequate for factor analysis. Bartlett's test is also used to ensure that the correlation matrix has sufficient relationships between items, and significant results indicate that the data is suitable for EFA (Bartlett, 1954; Yong & Pearce, 2013). In addition to factor loadings, item retention decisions should also consider communalities, cross-loadings, theoretical relevance, and expert judgment.

The determination of the number of factors is made based on eigenvalue values exceeding 1.00, scree plot inspection, and theoretical suitability. The eigenvalue criterion exceeding 1.00 is known as the Kaiser criterion (Kaiser, 1960). However, factor retention decisions must also take into account the clarity of the factor structure and theoretical fit (Hayton et al., 2004). The items in the instrument are evaluated based on factor loading, cross-loading, and communalities. In this study, a minimum factor loading value of .30 was used because the study was exploratory in nature. (Hair Jr. et al., 2019) explained that loadings between .30 and .40 can be considered a minimum level, while Costello & Osborne (2005) state that items with loadings above .30 can be considered if the factor structure is clear and there is no serious cross-loading. Tabachnick & Fidell (2019) also suggested a value around .32 as the minimum meaningful value. Therefore, the final decision to retain the items was made based on a combination of statistical evidence, content validity, and theoretical fit.

4. Results and Discussion

4.1. Objectives 1: Building a Malaysian Geography Teacher Professionalism Questionnaire Instrument based on the 2027 School Curriculum Framework

To achieve the first objective, this study developed a Malaysian Geography Teacher Professionalism Questionnaire Instrument based on the teaching needs of secondary school geography and the 2027 school curriculum framework. The process of developing this instrument was carried out systematically by adapting the approach of Walker & Fraser (2005), which goes through several main phases, namely determining the construct, formulating items, determining the measurement scale, and reviewing the content validity by experts. This approach aims to ensure that the items constructed are not only appropriate to the context of geography teacher professionalism but are also able to represent the dimensions being measured comprehensively.

In the initial phase (Table 1), the researcher reviewed the literature related to teaching professionalism, geography education, curriculum, pedagogy, assessment, and character education. This research enabled the researcher to identify the main elements relevant to the professional duties and practices of geography teachers. Based on the research, four main constructs were identified, namely, pedagogical practice, content mastery, assessment implementation, and character education. These four constructs were chosen because they describe the role of geography teachers comprehensively, encompassing aspects of teaching, knowledge mastery, student learning assessment, and value formation.

Table 1. Determination of Constructs and Items

Construct	Sub-Construct	Source
Pedagogical Practice	Geography teacher teaching strategies and approaches are student-centered such as inquiry, project-based learning, fieldwork and contextual pedagogy. This approach aims to support the understanding of geographical concepts and the formation of students' character holistically in line with the 2027 School Curriculum.	Kurikulum, 2018; Lateh & Muniandy, 2010; Lickona, 2004; Mahat et al., 2021; Malaysia, 2023; Seow et al., 2019
Content Mastery	The level of teachers' knowledge and understanding of geographical concepts, facts, issues and skills as stated in the Geography Curriculum. This also includes the teachers' ability to integrate current issues, local and global values into teaching in a meaningful way.	Kurikulum, 2018; Lateh & Muniandy, 2010; Mahat et al., 2021; Malaysia, 2023
Assessment Implementation	Teachers' competence in implementing authentic, formative and summative assessments that assess not only the mastery of knowledge and skills, but also the appreciation of values among students. This includes the use of rubrics, project assignments, learning reflection and online assessments that are in line with the principles of learning-based assessment.	Ghani & Adnan, 2015; Kurikulum, 2018; Lateh & Muniandy, 2010; Lickona, 2004; Mahat, Saleh, et al., 2024; Malaysia, 2023;

Construct	Sub-Construct	Source
Character Education	Teachers' continuous efforts in guiding and building students' character through the integration of noble values such as responsibility, empathy, integrity and patriotism in geography teaching. Character education is implemented through explicit and implicit approaches in the classroom as well as through activities outside the classroom.	Seow et al., 2019 Kurikulum, 2018; Lickona, 2004; Malaysia, 2023; Seow et al., 2019; Yusof et al., 2017

After the constructs were identified, questionnaire items were formulated to represent the four domains of geography teacher professionalism. Each construct contained 15 items, making the total instrument consist of 60 items. Items were labelled according to the constructs, namely Pedagogical Practice (A1–A15), Content Mastery (B1–B15), Assessment Implementation (C1–C15), and Character Education (D1–D15), to ensure that the measurement of each domain was more structured and balanced.

Table 2. Pedagogical Practice Items

No.	Items	Source
A1	I use inquiry-based learning strategies in implementing geography teaching.	Malaysia (2018) Seow et al. (2019)
A2	I carry out fieldwork with students.	Malaysia (2018) Seow et al. (2019)
A3	I encourage students to analyze topographic maps (direction, scale, and distance).	Malaysia (2018)
A4	I relate field studies to local and global geographic issues.	Malaysia (2018) Seow et al. (2019)
A5	I involve students in geographical project-based learning (e.g., building a city model).	Malaysia (2018)
A6	I guide students in discussing social issues (for example, environmental conservation).	Malaysia (2018)
A7	I combine group activities to solve geography problems.	Mahat et al. (2021) Malaysia (2018)
A8	I practice student-centered pedagogy such as cooperative learning.	Mahat et al. (2021) Malaysia (2018)
A9	I integrate the value of patriotism into local geography topics.	Malaysia (2023) Malaysia (2018)
A10	I use environmental case studies to develop critical thinking.	Lickona (2004) Malaysia (2018)
A11	I help students formulate ideas about the relationship between humans and nature based on data.	Malaysia (2018)
A12	I provide visual teaching materials such as photos and graphs for in-depth understanding.	Lateh & Muniandy (2010) Malaysia (2018)
A13	I teach the topic of plate tectonics through practical experience.	Malaysia (2018)
A14	I encourage students to reflect on human actions towards the environment.	Lickona (2004) Malaysia (2018)
A15	I incorporate teaching activities that develop students' communication skills.	Malaysia (2023) Malaysia (2018)

The Pedagogical Practice construct (Table 2) refers to the ability of teachers to plan and implement active, contextual, and student-centered geography teaching. This construct involves the use of strategies such as inquiry-based learning, fieldwork, project-based learning, group activities, the use of visual materials, and the development of students' communication skills. In addition, this construct also takes into account the ability of teachers to connect geography teaching with current issues, the environment, and the values of patriotism and critical thinking. Therefore, pedagogy in the context of this study does not only refer to the method of delivery but also involves teachers' efforts to make geography learning more meaningful and relevant to students' lives.

Table 3. Content Mastery Items

No.	Items	Source
B1	I mastered concepts in topographic maps such as direction, scale, distance, and position.	Malaysia (2018)
B2	I understand physical geographical processes such as plate movement and river formation.	Malaysia (2018)
B3	I distinguish between weather phenomena and climate.	Malaysia (2018)
B4	I explained the relationship between population growth and urbanization.	Malaysia (2018)
B5	I relate energy resources to resource management.	Malaysia (2018)
B6	I relate the content of physical geography to the value of environmental sustainability.	Malaysia (2018)
B7	I understand the impact of natural vegetation and wildlife on ecosystems.	Malaysia (2018)
B8	I analyze the issue of world population migration against population.	Malaysia (2018)
B9	I use data such as maps and graphs to facilitate student understanding.	Lateh & Muniandy (2010)
B10	I explain the impact of human activities on the physical environment.	Malaysia (2018)
B11	I understand the interdependence of physical systems with humans.	Malaysia (2018)
B12	I adapt the geography examples according to the context of the students' existing knowledge.	Mahat et al. (2021)
B13	I explain the concept of GIS and its importance to students.	Malaysia (2018)
B14	I understand the basic concepts of geography, such as settlement and urbanization.	Malaysia (2018)
B15	I integrate values in teaching geography, for example, the value of patriotism.	Malaysia (2023)

The Content Mastery construct (Table 3) was also built to assess teachers' level of knowledge and understanding of geography content. This construct includes mastery of concepts such as topographic maps, physical geography, weather and climate, settlements, urbanization, migration, energy resources, ecosystems, GIS, and human-environment relationships. In addition to mastering facts and concepts, teachers also need to be able to adapt teaching examples to students' existing knowledge and integrate values into teaching content. Therefore, this construct assesses not only teachers' knowledge of the discipline of geography but also teachers' ability to apply the content in real teaching contexts.

Table 4. Assessment Implementation Items

No.	Items	Source
C1	I use formative assessment continuously throughout teaching.	Malaysia (2023)
C2	I check students' understanding of the content based on facts.	Malaysia (2018)
C3	I evaluate students' project assignments based on a rubric.	Ghani & Adnan (2015)
C4	I provide meaningful feedback on students' appreciation of values.	Malaysia (2018)
C5	I involve students in assessing their work using a self-assessment rubric.	Lickona (2004)
C6	I evaluate fieldwork results based on mastery of geographic skills.	Malaysia (2023)
C7	I assess the value components in group assignments.	Malaysia (2018)
C8	I record the students' development from a personality perspective throughout the year.	Malaysia (2018)
C9	I use online assessments to evaluate student work.	Seow et al. (2019)
C10	I assess students based on criteria such as application of 21st-century values and skills.	Lickona (2004)

No.	Items	Source
C11	I evaluate the quality of assignments such as graphs, charts, or tables produced by students.	Lateh & Muniandy (2010) Malaysia (2018)
C12	I conduct task-based assessments based on real-life situations.	Malaysia (2018)
C13	I assess students holistically, encompassing cognitive, skill, and affective aspects.	Ghani & Adnan (2015) Malaysia (2018)
C14	I conducted an analysis of student reflections after teaching activities.	Lickona (2004) Seow et al. (2019)
C15	I use formative assessment for appropriate follow-up pedagogical actions.	Malaysia (2023) Malaysia (2018)

The Assessment Implementation construct (Table 4) focuses on teachers' practices in assessing students' learning in a continuous and meaningful way. Items for this construct include formative assessment, use of rubrics, project assignment assessment, fieldwork assessment, real-life situation-based assessment, feedback on values appreciation, online assessment, and holistic assessment. In the context of geography education, assessment not only aims to measure students' academic mastery but also to assess students' skills, attitudes, values, and ability to apply geography knowledge in real-life situations.

Table 5. Character Education Items

No.	Items	Source
D1	I emphasize values such as responsibility and trust in every lesson.	Lickona (2004) Malaysia (2018)
D2	I encourage students to appreciate the uniqueness of Malaysia's geographical identity.	Malaysia (2023) Malaysia (2018)
D3	I help students make ethical decisions regarding environmental issues.	Lickona (2004) Malaysia (2018)
D4	I demonstrate positive values such as respect and integrity during teaching.	Lickona (2004) Yusof et al. (2017)
D5	I associate lessons such as settlement and urbanization with the spirit of patriotism.	Malaysia (2023) Malaysia (2018)
D6	I guide students to understand civic responsibility through teaching geography.	Malaysia (2018)
D7	I foster a sense of pride in the country's geographical heritage.	Malaysia (2023) Malaysia (2018)
D8	I encourage students to be empathetic when discussing humanitarian issues in geography.	Lickona (2004)
D9	I praise students who show positive values in class activities.	Lickona (2004)
D10	I plan learning activities that foster values such as gratitude and respect for culture.	Malaysia (2018)
D11	I help students distinguish sustainable practices from practices that pollute.	Malaysia (2018)
D12	I guide students to understand the impact of human behavior on the environment.	Malaysia (2018)
D13	I use the topic of geography to build students' moral awareness.	Lickona (2004) Malaysia (2018)
D14	I make field study projects a way for students to practice community values.	Malaysia (2018) Seow et al. (2019)
D15	I integrate character education in all aspects of teaching geography.	Lickona (2004) Malaysia (2023) Malaysia (2018)

The character education construct (Table 5) was developed to assess the role of geography teachers in shaping students' values and personalities through teaching. This construct encompasses values such as responsibility, trust, empathy, integrity, patriotism, moral awareness, civic responsibility, and environmental sustainability. In the geography subject, character education can be applied through discussions on environmental issues, field studies, humanitarian issues, Malaysia's geographical identity, and human relationships with the environment. Therefore, this construct emphasizes that geography teachers not only have a role in delivering the subject content but also in guiding students to become ethical, caring, and responsible individuals.

This instrument uses a five-point Likert scale (Table 6). For constructs related to practice such as pedagogy, assessment, and character education, the scale is built based on the level of frequency of implementation, which ranges from Never to Always/Every Time. For the content mastery construct, the scale is adjusted to the respondent's level of mastery, which ranges from not mastered at all to fully mastered. The difference in the form of this scale is used because the constructs being measured have different properties; some measure practice, while others measure the level of mastery of knowledge and skills.

Table 6. Use of Five-Point Likert Scale Types

Construct	Level	Score	Description
Pedagogical Practice	Never	1	I have never practiced this practice.
	Rarely / Almost Never	2	I rarely/almost never carry out this practice.
	Sometimes / Occasionally	3	I sometimes / occasionally carry out this practice.
	Often / Almost Every Time	4	I often/almost always carry out this practice.
	Always / Every Time	5	I always/at all times consistently implement this practice.
Content Mastery	Not Directly Controlling	1	I do not have complete control over this knowledge/skill.
	Less Mastery	2	I lack this knowledge/skill.
	Mastering Small Parts	3	I have mastered a small part of this knowledge/skill.
	Mastering the Majority	4	I have mastered most of this knowledge/skill.
	Fully Mastered	5	I have fully mastered this knowledge/skill.
Assessment Implementation	Never	1	I have never carried out this assessment.
	Rarely / Almost Never	2	I rarely/almost never carry out this assessment.
	Sometimes / Occasionally	3	I sometimes / occasionally carry out this assessment.
	Often / Almost Every Time	4	I often/almost always carry out this assessment.
	Always / Every Time	5	I always/at all times consistently perform this assessment.
Character Education	Never	1	I have never practiced this practice.
	Rarely / Almost Never	2	I rarely/almost never carry out this practice.
	Sometimes / Occasionally	3	I sometimes / occasionally carry out this practice.
	Often / Almost Every Time	4	I often/almost always carry out this practice.
	Always / Every Time	5	I always/at all times consistently implement this practice.

Next, the constructed instrument is reviewed by a panel of experts to ensure that the formulated items are appropriate, clear, and represent the constructs to be measured. Expert review involves examining aspects of language, appropriateness of terminology, and accuracy of item meaning and content representation. This process is important to ensure that the instrument has content validity before being used in actual research. Expert views are also used to improve items that are unclear, avoid overlapping meanings between items, and ensure that all constructs of geography teacher professionalism are adequately represented.

Overall, the construction of the Malaysian Geography Teacher Professionalism Questionnaire Instrument was carried out through a planned process and based on a clear construct. This instrument was built to measure four main dimensions of geography teacher professionalism, namely pedagogical practice, content mastery, assessment implementation, and character education. Through the process of item construction, scale determination, and expert review, this instrument is able to be a suitable measurement tool to assess the professionalism of geography teachers in the context of secondary school education in Malaysia.

4.2. Objectives 2: Validating the constructs of the Malaysian Geography Teacher Professionalism Questionnaire Instrument using Exploratory Factor Analysis (EFA).

To answer the second objective, Exploratory Factor Analysis (EFA) was conducted to assess the construct validity of the Malaysian Geography Teacher Professionalism Questionnaire instrument. This analysis aimed to identify the factor structure formed from the instrument items and determine whether the items constructed could empirically measure the construct of geography teacher professionalism. In this study, EFA was conducted using the Principal Component Analysis (PCA) method with Varimax rotation with Kaiser normalization.

Table 7. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.937
	Approx. Chi-Square	10858.167
Bartlett's Test of Sphericity	df	1770
	Sig.	.000

Before factor analysis was conducted, the data suitability was tested using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity. Based on Table 7, the KMO value obtained was .937. This value indicates that the study data has a very good level of sample adequacy and is suitable for analysis using EFA. According to Kaiser & Rice (1974), a KMO value exceeding .90 can be interpreted as very excellent or marvelous. Hair Jr. et al. (2019) also explained that a high KMO value indicates that the correlation pattern between items is sufficient to allow factor analysis to be conducted. Therefore, a KMO value of .937 indicates that the items in the instrument have a high suitability for analysis through EFA.

In addition, the results of Bartlett's Test of Sphericity showed a significant value, namely $\chi^2 = 10858.167$, $df = 1770$, $p < .001$. This finding indicates that the correlation matrix is not an identity matrix, and there is a significant correlation between the items in the instrument. According to Bartlett (1954), Bartlett's test is used to determine whether the correlation matrix has sufficient relationships to be factored. Yong & Pearce (2013) also explained that the significant Bartlett's test results showed that the data was suitable for EFA because the items had sufficient correlation. Overall, the very high KMO value and the significant Bartlett's test results proved that the study data met the prerequisites for conducting exploratory factor analysis.

Table 8. Total Variance Explained

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.518	32.530	32.530	19.518	32.530	32.530	9.142	15.236	15.236
2	4.136	6.893	39.423	4.136	6.893	39.423	8.433	14.055	29.291
3	3.623	6.038	45.461	3.623	6.038	45.461	6.337	10.561	39.852
4	2.220	3.699	49.161	2.220	3.699	49.161	5.585	9.308	49.161

Extraction Method: Principal Component Analysis.

Although the four-factor solution explained 49.161% of the total variance, this value should be interpreted with caution. In educational and social science research, constructs such as teacher professionalism are complex and multidimensional, which may result in moderate explained variance. Therefore, the variance explained in this study provides initial support for the factor structure, but it also indicates the need for further item refinement and confirmatory validation in future studies.

Table 8 shows the results of total variance explained. Based on the table, four factors were extracted through the PCA method. All four factors have eigenvalues greater than 1.00, namely Factor 1 = 19.518, Factor 2 = 4.136, Factor 3 = 3.623, and Factor 4 = 2.220. The selection of factors based on eigenvalues greater than 1.00 is in line with the Kaiser criterion, namely, factors with eigenvalues greater than one are considered to have sufficient variance contribution to be retained in factor analysis (Hayton et al., 2004; Kaiser, 1960).

In terms of variance contribution, the first factor contributed 32.530%, the second factor 6.893%, and the third factor 6.038%, while the fourth factor contributed 3.699%. Overall, the four extracted factors explained 49.161% of the total variance of the entire instrument. In the context of social and educational studies, the total variance explained needs to be interpreted together with the factor structure, theoretical suitability, and clarity of factor loading items because EFA

aims to identify patterns of relationships between items and form constructs that can be interpreted meaningfully (Hair Jr. et al., 2019; Yong & Pearce, 2013).

After the Varimax rotation process, the variance contribution of each factor became more balanced. The first factor contributed 15.236%, the second factor 14.055%, the third factor 10.561%, and the fourth factor 9.308%. Factor rotation helps produce a clearer and easier to interpret factor structure, especially when there is more than one factor in the model. This finding indicates that the instrument does not rely solely on one dominant factor but rather has four dimensions that can be interpreted separately and in line with the theoretical constructs of the study.

Table 9. Rotated Component Matrix

	Components			
	1	2	3	4
D7. I foster a sense of pride in the country's geographical heritage.	.798			
D8. I encourage students to be empathetic when discussing humanitarian issues in geography.	.786			
D 6. I guide students to understand civic responsibility through teaching geography.	.782			
D12. I guide students to understand the impact of human behavior on the environment.	.771			
D2. I encourage students to appreciate the uniqueness of Malaysia's geographical identity.	.763			
D4. I demonstrate positive values such as respect and integrity during teaching.	.727			
D13. I use the topic of geography to build students' moral awareness.	.721			
D11. I help students distinguish sustainable practices from practices that pollute.	.710			
D1. I emphasize values such as responsibility and trust in every lesson.	.685			
D10. I plan learning activities that foster values such as gratitude and respect for culture.	.651			
D3. I help students make ethical decisions regarding environmental issues.	.645			
D5. I associate subjects such as settlement and urbanization with the spirit of patriotism.	.639			
D9. I praise students who show positive values in class activities.	.624			
D15. I integrate character education in all aspects of teaching geography.	.537			
D14. I make field research projects a way for students to practice community values.	.388			
B4. I explained the relationship between population growth and urbanization.	.807			
B10. I explain the impact of human activities on the physical environment.	.767			
B11. I understand the interdependence of physical systems with humans.	.762			
B6. I relate the content of physical geography to the value of environmental sustainability.	.755			
B7. I understand the impact of natural vegetation and wildlife on ecosystems.	.754			
B3. I distinguish between weather phenomena and climate.	.747			
B5. I relate energy resources to resource management.	.742			
B14. I understand basic concepts of geography such as settlement and urbanization.	.723			
B12. I adapt geography examples according to the context of students' existing knowledge.	.693			
B2. I understand physical geographical processes such as plate movement and river formation.	.664			
B8. I analyze the issue of world population migration against population.	.615			
B1. I master concepts in topographic maps such as direction, scale, distance, and position.	.609			
B9. I use data such as maps and graphs to facilitate students' understanding.	.590			
B15. I integrate values in geography teaching, for example, the value of patriotism.	.521			
B13. I explain the concept of GIS and its importance to students.	.342			
C10. I assess students based on criteria such as the application of 21st-century values and skills.	.710			
C3. I evaluate students' project assignments based on a rubric.	.640			
C7. I evaluate the value components in group assignments.	.625			
C8. I record the students' development in terms of personality throughout the year.	.615			
C15. I use formative assessment for appropriate follow-up pedagogical actions.	.591			
C5. I involve students in assessing their work using a self-assessment rubric.	.583			
C9. I use online assessments to evaluate student work.	.572			
C12. I conduct task-based assessments based on real-life situations.	.534			
C4. I provide meaningful feedback on students' appreciation of values.	.532			
C14. I conduct an analysis of student reflections after teaching activities.	.524			
C6. I evaluate the results of fieldwork based on mastery of geographical skills.	.472			
C2. I check students' understanding of the content based on facts.	.464			
C1. I use formative assessment continuously throughout teaching.	.464			
C13. I assess students holistically, encompassing cognitive, skill, and affective aspects.	.459			

	Components			
	1	2	3	4
C11. I evaluate the quality of assignments such as graphs, charts, or tables produced by students.			.392	
A12. I provide visual teaching materials such as photos and graphs for in-depth understanding.			.252	
A10. I use environmental case studies to develop critical thinking.			.652	
A9. I integrate the value of patriotism into local geography topics.			.643	
A4. I relate fieldwork to local and global geographical issues.			.585	
A11. I help students formulate ideas about the relationship between humans and nature based on data.			.580	
A6. I guide students to discuss social issues (for example, environmental conservation).			.553	
A5. I involve students in geographical project-based learning (for example, building a city model).			.550	
A7. I combine group activities to solve geography problems.			.534	
A1. I use inquiry-based learning strategies in implementing geography teaching.			.512	
A14. Encourage students to reflect on human actions towards the environment.			.487	
A15. I incorporate teaching activities that develop students' communication skills.			.486	
A8. I practice student-centered pedagogy such as cooperative learning.			.466	
A2. I carry out fieldwork with students.			.465	
A13. I teach the topic of plate tectonics through practical experience.			.434	
A3. I encourage students to analyze topographic maps (direction, scale, and distance).			.434	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Based on Table 9, the results of the Rotated Component Matrix show that the Malaysian Geography Teacher Professionalism questionnaire instrument formed four main components after the analysis was conducted using Principal Component Analysis (PCA) with Varimax rotation with Kaiser normalization. The factor rotation reached a solution after six iterations, indicating that the formed factor structure was stable and interpretable. Overall, the findings showed that the majority of items had satisfactory factor loading values, which exceeded the minimum value of .30 often used in exploratory studies. The highest loading value in the table was .807, while the lowest loading value displayed was .252 for item A12.

The first component consists of items related to character education in geography teaching. This component is represented by items D1 to D15. The factor loading values for this component range from .388 to .798. The item with the highest loading is D7, which is “I foster a sense of pride in the country’s geographical heritage” with a loading value of .798. This is followed by D8 = .786, D6 = .782, D12 = .771, D2 = .763, D4 = .727, D13 = .721, and D11 = .710. These high loading values indicate that the items have a strong relationship with the character education construct. Conceptually, the items in this component describe the role of geography teachers in instilling the values of patriotism, empathy, civic responsibility, integrity, moral awareness, and environmental sustainability in teaching. Therefore, the first component is appropriately named Character Education in Geography Teaching.

In addition, other items in the first component such as D1 = .685, D10 = .651, D3 = .645, D5 = .639, D9 = .624, D15 = .537, and D14 = .388 also show acceptable loadings. Although D14 recorded the lowest loading value in this component, it still exceeded the minimum value of .30. Item D14 is related to the use of field research projects as a way for students to practice community values. From a content point of view, this item is still in line with character education because it emphasizes the practice of values through geography activities. Therefore, item D14 can still be maintained in the character education component.

The second component refers to geography content knowledge. This component consists of items B1 to B15. The factor loading values for this component range from .342 to .807. The item with the highest loading is B4, which is “I explain the relationship between population growth and urbanization” with a loading value of .807. This is followed by B10 = .767, B11 = .762, B6 = .755, B7 = .754, B3 = .747, B5 = .742, and B14 = .723. This finding shows that these items have a strong relationship with the geography content knowledge construct. These items describe teachers' mastery of the concepts of physical geography, human geography, urbanization, weather and climate, energy resources, ecosystems, and human relationships with the environment.

Other items such as B12 = .693, B2 = .664, B8 = .615, B1 = .609, B9 = .590, B15 = .521, and B13 = .342 also showed loading values above .30. Although B13 recorded the lowest loading value in the second component, this item is still

acceptable because its loading value is above .30. Item B13 is related to the explanation of the concept of GIS and its importance to students. From a content point of view, GIS is an important element in modern geography education because it is related to the skills of understanding space, location, geographic data, and geospatial technology. Therefore, B13 can be maintained in the Geography content knowledge construct because it has reasonable theoretical importance and content validity.

The third component refers to assessment in the teaching and learning of geography. This component is represented by items C, namely C1 to C15. The loading values for item C range from .392 to .710. The item with the highest loading is C10, which is “I assess students based on criteria such as the application of 21st-century values and skills” with a loading value of .710. This item is followed by C3 = .640, C7 = .625, C8 = .615, C15 = .591, C5 = .583, and C9 = .572. These findings indicate that the items in the third component have a clear relationship with assessment constructs, particularly rubric-based assessment, project assignments, values, personality, formative assessment, and online assessment.

Other items such as C12 = .534, C4 = .532, C14 = .524, C6 = .472, C2 = .464, C1 = .464, C13 = .459, and C11 = .392 also still achieve acceptable loading values. Although C11 has a lower loading compared to other C items, the value is still above .30 and can be maintained. The content of C11 is related to the assessment of the quality of graphs, charts, or tables produced by students. In the context of geography, this item is still important because students use a lot of visual data, tables, graphs, and charts in the learning and assessment process. Therefore, the third component is appropriately named Assessment in Teaching and Learning Geography.

The fourth component refers to the pedagogy of teaching geography. This component is represented by items A, specifically items A1 to A11, A13, A14, and A15. The factor loading values for the items in this component range from .434 to .652. The item with the highest loading is A10, which is “I use environmental case studies to develop critical thinking” with a loading value of .652. This is followed by A9 = .643, A4 = .585, A11 = .580, A6 = .553, A5 = .550, A7 = .534, and A1 = .512. These loading values indicate that the items have a satisfactory relationship with the pedagogical construct of teaching geography.

Other items such as A14 = .487, A15 = .486, A8 = .466, A2 = .465, A13 = .434, and A3 = .434 also achieved acceptable loading values. Overall, the items in this component reflect the pedagogical practices of geography teachers, such as inquiry-based learning, fieldwork, project-based learning, group activities, use of case studies, student reflection, communication skills, and student-centered learning. Therefore, the fourth component is appropriately named Geography Teaching Pedagogy.

Item A12 recorded a factor loading of .252, which is below the commonly accepted minimum threshold of .30 in exploratory factor analysis. Statistically, this indicates that the item has a weak relationship with the pedagogy factor. However, the item was retained provisionally because of its theoretical and content relevance to geography teaching, particularly in relation to the use of visual materials such as photographs, graphs, maps, charts, and landscape images. Nevertheless, item A12 should be reworded and retested in future validation studies. If its loading remains low in subsequent analyses, the item should be considered for removal from the final version of the instrument.

Therefore, although A12 has a low statistical loading, this item is still considered important in terms of content and theory. In instrument development, the decision to retain or drop an item does not only depend on statistical value alone but also needs to take into account the item's suitability with the construct, curriculum needs, expert views, and the importance of the item in the actual context of the study. In this case, A12 was retained because experts have assessed the item as relevant to measuring the professionalism of geography teachers, especially in the aspect of providing visual teaching aids to improve student understanding.

Overall, the findings of the Rotated Component Matrix in Table 9 confirm that this instrument has a clear four-factor structure, namely Character Education in Geography Teaching, Geography Content Knowledge, Assessment in Geography Teaching and Learning, and Geography Teaching Pedagogy. The emergence of character education as the first factor suggests that geography teacher professionalism in the Malaysian context is not perceived merely as technical teaching competence, but also as a value-oriented professional practice. This finding is meaningful because geography education deals directly with environmental responsibility, civic awareness, patriotism, empathy, and human-environment relationships. Therefore, the empirical factor structure is generally consistent with the theoretical foundation of the instrument and the emphasis of the 2027 School Curriculum Framework. The majority of items show satisfactory loading values and are maintained based on content validity by experts. Therefore, these EFA findings support the construct validity of the Malaysian Geography Teacher Professionalism questionnaire instrument.

4.3. Implications for Policy and Practice

This instrument may assist educational policymakers, curriculum planners, and teacher education institutions in identifying the professional development needs of geography teachers. At the policy level, the instrument can be used to assess teachers' readiness to implement the 2027 School Curriculum Framework. At the school level, it may serve as a self-reflection tool for geography teachers to evaluate their pedagogical practices, content mastery, assessment implementation, and integration of character education. Teacher training institutions may also use the instrument to design targeted professional development programmes related to geography pedagogy, GIS, authentic assessment, fieldwork, and values-based geography education.

4.4. Limitations and Future Research

This study has several limitations. First, the validation process was limited to exploratory factor analysis; therefore, the findings provide only preliminary evidence of construct validity. Future studies should conduct confirmatory factor analysis using an independent sample to verify the four-factor model. Second, although the sample size of 300 respondents is acceptable for EFA, a larger sample would strengthen the stability and generalizability of the factor structure. Third, item A12 should be refined and retested because it recorded a loading below the recommended threshold. Future research should also examine reliability, convergent validity, discriminant validity, and measurement invariance across gender, teaching experience, school location, and state.

5. Conclusion

In conclusion, this study developed the Malaysian Geography Teacher Professionalism Questionnaire and provided preliminary evidence of its four-factor structure through exploratory factor analysis. The findings suggest that the instrument has potential to measure geography teachers' professionalism in terms of pedagogical practice, content mastery, assessment implementation, and character education. However, the instrument should be further validated using confirmatory factor analysis, reliability testing, convergent validity, discriminant validity, and measurement invariance before it is widely adopted in research, policy, or professional development contexts.

Acknowledgements: This research was awarded by Universiti Pendidikan Sultan Idris (UPSI) under the FSK Comprehensive Research Grant Scheme 2025 (Research Code: 2025-0195-106-01).

Funding Statement: This study was fully funded by Universiti Pendidikan Sultan Idris (UPSI) through the FSK Comprehensive Research Grant Scheme 2025 (Research Code: 2025-0195-106-01).

Conflicts of Interest: The authors declare no conflicts of interest regarding the research authorship or publication of this study.

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