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Lampiran : satu berkas
Hal : Penyampaian Salinan SK Peserta
Program BARISTA Gelombang-II

Yth. Bapak/Ibu
Pimpinan dan Anggota Komisi VII
DPR RI
di Jakarta

Sehubungan dengan pelaksanaan program Bantuan Riset Bagi Talenta Riset dan Inovasi (BARISTA) Badan Riset dan Inovasi Nasional (BRIN), bersama ini dengan hormat kami sampaikan salinan Surat Keputusan Deputi Bidang Sumber Daya Manusia Ilmu Pengetahuan dan Teknologi Nomor 109/II/HK/2022 tentang Peserta Program Bantuan Riset Bagi Talenta Riset dan Inovasi Gelombang II Tahun 2022, terlampir.

Sebagai informasi, pendaftar yang belum masuk dalam Surat Keputusan Gelombang II tersebut saat ini sedang dalam proses verifikasi kelengkapan sesuai ketentuan Program.

Demikian kami sampaikan. Atas perhatian Bapak/Ibu Anggota Komisi VII DPR RI yang terhormat, kami ucapkan terima kasih.

Plt. Deputi Bidang Pemanfaatan Riset dan
Inovasi



Dr. R. Hendrian, M.Sc.
NIP 196611211994031001

Tembusan, Yth:

1. Kepala Badan Riset dan Inovasi Nasional (sebagai laporan);
2. Plt. Sekretaris Utama BRIN;
3. Plt. Deputi Bidang Sumber Daya Manusia Iptek BRIN;
4. Plt. Deputi Bidang Fasilitas Riset dan Inovasi BRIN;
5. Direktur Manajemen Talenta BRIN;
6. Plt. Sekretaris Deputi Bidang Sumber Daya Manusia Iptek BRIN.
7. Plt. Sekretaris Deputi Bidang Fasilitas Riset dan Inovasi BRIN;
8. Plt. Sekretaris Deputi Bidang Pemanfaatan Riset dan Inovasi BRIN;
9. Tenaga Ahli Pimpinan dan Anggota Komisi VII DPR RI;
10. Direktur Pemanfaatan Riset dan Inovasi pada K/L, Masyarakat dan UMKM BRIN;
11. Koordinator Narahubung Program Berbakti untuk Negeri BRIN



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BRIN

BADAN RISET
DAN INOVASI NASIONAL

KEPUTUSAN

DEPUTI BIDANG SUMBER DAYA MANUSIA ILMU PENGETAHUAN DAN TEKNOLOGI
BADAN RISET DAN INOVASI NASIONAL
NOMOR 109/II/HK/2022
TENTANG
PESERTA PROGRAM BANTUAN RISET BAGI TALENTA RISET DAN INOVASI
BADAN RISET DAN INOVASI NASIONAL
GELOMBANG II TAHUN 2022

DEPUTI BIDANG SUMBER DAYA MANUSIA ILMU PENGETAHUAN DAN TEKNOLOGI
BADAN RISET DAN INOVASI NASIONAL,

- Menimbang : a. bahwa untuk meningkatkan kompetensi di bidang riset dan inovasi bagi talenta riset dan inovasi Indonesia, perlu memberikan pendampingan dan bantuan riset untuk mahasiswa yang sedang dan/atau akan menyelesaikan tugas akhir berbasis riset melalui program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Nasional;
- b. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a, perlu menetapkan Keputusan Deputi Bidang Sumber Daya Manusia Ilmu Pengetahuan dan Teknologi Badan Riset dan Inovasi Nasional tentang Peserta Program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Indonesia Gelombang II Tahun 2022;
- Mengingat : 1. Peraturan Presiden Nomor 78 Tahun 2021 tentang Badan Riset dan Inovasi Nasional (Lembaran Negara Republik Indonesia Tahun 2021 Nomor 192);
2. Peraturan Badan Riset dan Inovasi Nasional Nomor 1 Tahun 2021 tentang Organisasi dan Tata Kerja Badan Riset dan Inovasi Nasional (Berita Negara Republik Indonesia Tahun 2021 Nomor 977);
3. Keputusan Kepala Badan Riset dan Inovasi Nasional Nomor 8/HK/2021 tentang Pelimpahan Wewenang Kepala Badan Riset dan Inovasi Nasional Kepada Pelaksana Tugas di Lingkungan Badan Riset dan Inovasi Nasional;
4. Keputusan Kepala Badan Riset dan Inovasi Nasional Nomor 3/HK/2022 tentang Petunjuk Teknis Pelaksanaan Bantuan Riset Bagi Talenta Riset dan Inovasi;

MEMUTUSKAN:

- Menetapkan : KEPUTUSAN DEPUTI BIDANG SUMBER DAYA MANUSIA ILMU PENGETAHUAN DAN TEKNOLOGI BADAN RISET DAN INOVASI NASIONAL TENTANG PESERTA PROGRAM BANTUAN RISET BAGI TALENTA RISET DAN INOVASI BADAN RISET DAN INOVASI NASIONAL GELOMBANG II TAHUN 2022;
- KESATU : Menetapkan Peserta Program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Nasional Gelombang II Tahun 2022 sebagaimana tercantum dalam Lampiran yang merupakan bagian tidak terpisahkan dari Keputusan Deputi Badan ini;
- KEDUA : Peserta Program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Nasional Tahun 2022 berhak mendapatkan:
- a. pendampingan kegiatan riset oleh periset Badan Riset dan Inovasi Nasional; dan
- b. bantuan pembiayaan riset tugas akhir, berupa bantuan uang kuliah tunggal (UKT) dan bantuan biaya riset tugas akhir sesuai jenjang pendidikan;

- KETIGA : Pemberian bantuan biaya riset tugas akhir mempertimbangkan status kemajuan studi pada semester yang ditentukan dan penyampaian laporan hasil riset tugas akhir yang dilaksanakan;
- KEEMPAT : Peserta Program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Nasional Tahun 2022 berkewajiban untuk melaksanakan riset tugas akhir dan menyampaikan laporan hasil riset tugas akhir sesuai dengan jenjang pendidikannya kepada Badan Riset dan Inovasi Nasional melalui Direktorat Manajemen Talenta;
- KELIMA : Direktur Manajemen Talenta melaporkan pengelolaan pelaksanaan Program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Nasional kepada Deputy Bidang Sumber Daya Manusia Ilmu Pengetahuan dan Teknologi berdasarkan hasil evaluasi pelaksanaan Program Bantuan Riset Bagi Talenta Riset dan Inovasi Badan Riset dan Inovasi Nasional;
- KEENAM : Biaya untuk melaksanakan Keputusan Deputy ini bersumber dari Anggaran Belanja Badan Riset dan Inovasi Nasional yang berkenaan dan/atau sumber dana lain yang sah;
- KETUJUH : Keputusan Deputy Badan ini mulai berlaku pada tanggal ditetapkan.

Ditetapkan di Jakarta
pada tanggal 26 Agustus 2022

PELAKSANA TUGAS
DEPUTI BIDANG SUMBER DAYA MANUSIA
ILMU PENGETAHUAN DAN TEKNOLOGI
BADAN RISET DAN INOVASI NASIONAL,

Ttd.

EDY GIRI RACHMAN PUTRA

SALINAN Keputusan Deputy Badan ini disampaikan kepada:

1. Kepala Badan Riset dan Inovasi Nasional;
2. Sekretaris Utama Badan Riset dan Inovasi Nasional;
3. Inspektur Utama Badan Riset dan Inovasi Nasional;
4. Kepala Unit Kerja di lingkungan Badan Riset dan Inovasi Nasional;
5. Rektor pada Perguruan Tinggi terkait;
6. Masing-masing peserta program yang bersangkutan.

Salinan sesuai dengan aslinya,
Sekretaris Deputy
Bidang Sumber Daya Manusia
Ilmu Pengetahuan dan Teknologi

 TT ELEKTRONIK
BRIN

Nining Setyowati Dwi Andayani



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LAMPIRAN
 KEPUTUSAN DEPUTI BIDANG SUMBER DAYA MANUSIA ILMU PENGETAHUAN DAN TEKNOLOGI
 BADAN RISET DAN INOVASI NASIONAL
 NOMOR 109/II/HK/2022
 TENTANG
 PESERTA PROGRAM BANTUAN RISET BAGI TALENTA RISET DAN INOVASI
 BADAN RISET DAN INOVASI NASIONAL GELOMBANG II TAHUN 2022

PESERTA PROGRAM BANTUAN RISET BAGI TALENTA RISET DAN INOVASI
 BADAN RISET DAN INOVASI NASIONAL GELOMBANG II TAHUN 2022

NO	NAMA	NPM	JENJANG	PROGRAM STUDI	PERGURUAN TINGGI	JUMLAH SEMESTER YANG DIBERIKAN BANTUAN UKT
1	2	3	4	5	6	7
1	Anwar Jailani	2127201020041	S2	Pendidikan Agama Islam	IAI An Nur Lampung	2
2	Toyo Wiyatno	21102001	S2	Pendidikan Matematika	IKIP Siliwangi	2
3	Widiana Nur Drajat	19060326	S1	Pendidikan Guru Sekolah Dasar	IKIP Siliwangi	2
4	Sheilla Zalzabilla Al-Jabar	19510210	S1	Pendidikan Matematika	IKIP Siliwangi	2
5	Hilwah Dzibaqiyya	195264013	D4	Manajemen Pemasaran	Politeknik Negeri Bandung	2
6	Annastasya Rahmadhani	191344004	D4	Teknik Telekomunikasi	Politeknik Negeri Bandung	2
7	Putri Dwi Salwa	P17324119425	D4	Kebidanan	Poltekkes Kemenkes Bandung	2
8	Athifah Azmi Taqiyyah	P17331119044	D4	Gizi dan Dietetika	Poltekkes Kemenkes Bandung	2
9	Nazma Nurmanisa	P17324119420	D4	Kebidanan	Poltekkes Kemenkes Bandung	2
10	Rubbyatul Aulia	P17324119428	D4	Kebidanan	Poltekkes Kemenkes Bandung	2

NO	NAMA	NPM	JENJANG	PROGRAM STUDI	PERGURUAN TINGGI	JUMLAH SEMESTER YANG DIBERIKAN BANTUAN UKT
1	2	3	4	5	6	7
11	Yuyung Yuliani	1901074	S1	Manajemen Pendidikan Islam	STAI Bhakti Persada Bandung	2
12	Sela Amelia	2019110028	S1	Pendidikan Agama Islam	STAI Yapata Aljawami	2
13	R. Siti Munigar	1920.2.068	S1	Manajemen Pemasaran	STIE Gema Widya Bangsa	2
14	Adi Yusran	195010	S1	Akuntansi	STIE Tridharma Bandung	2
15	Dwi Putri Sundari	195014	S1	Akuntansi	STIE Tridharma Bandung	2
16	Dyah Ayu Sekar Melati	195001	S1	Akuntansi	STIE Tridharma Bandung	2
17	Hana Nurisma Pratiwi	195003	S1	Akuntansi	STIE Tridharma Bandung	2
18	Neng Siti Jenab	195009	S1	Akuntansi	STIE Tridharma Bandung	2
19	Anggadiwirya	192017	S1	Manajemen	STIE Tridharma Bandung	2
20	Arti Rishan Nuresa	192012	S1	Manajemen	STIE Tridharma Bandung	2
21	Diah Maulani	192019	S1	Manajemen	STIE Tridharma Bandung	2
22	Reli Siregar	192004	S1	Manajemen	STIE Tridharma Bandung	2
23	Rininta Alvinia	192001	S1	Manajemen	STIE Tridharma Bandung	2
24	Ahmad Hasan Sandi	1941003	S1	Informatika	STT Mandala Bandung	2
25	Fahmi Ali Ramdhani	3200110009	S3	Hukum Islam	UIN Sunan Gunung Djati Bandung	2
26	Eka Sandi Saputra Subrata	2200020023	S2	Ekonomi Islam	UIN Sunan Gunung Djati Bandung	2

NO	NAMA	NPM	JENJANG	PROGRAM STUDI	PERGURUAN TINGGI	JUMLAH SEMESTER YANG DIBERIKAN BANTUAN UKT
1	2	3	4	5	6	7
27	Gilang Samudra	2200110005	S2	Hukum Ekonomi Syariah	UIN Sunan Gunung Djati Bandung	2
28	Khoirul Aziz	2200050005	S2	Hukum Keluarga	UIN Sunan Gunung Djati Bandung	2
29	Aliea Aqshalina Apriliani	1193060008	S1	Hukum Pidana Islam	UIN Sunan Gunung Djati Bandung	2
30	Ratna Putri Meina	1193060069	S1	Hukum Pidana Islam	UIN Sunan Gunung Djati Bandung	2
31	Intan Fauziah	202180022	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
32	Ismi Khoerunnisa	202180016	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
33	Jenni Setiawati	202180048	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
34	Muhammad Ramdhan	202180020	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
35	Nasti Apriliani	202180036	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
36	Neng Trina Nur Ratmanah	202180062	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
37	Nindya Raznanhani Nurikhsan	202180040	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
38	Nonik Wulandari	202180017	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
39	Siti Nurmila	202180037	S1	Pendidikan Bahasa Inggris	Universitas Bale Bandung	1
40	Hasan Al Mubarak Sidiq	402019121012	S1	Pendidikan Bahasa Arab	Universitas Darussalam Gontor	2
41	Achda Fitriah	2006491462	S2	Ilmu Fisika	Universitas Indonesia	2

NO	NAMA	NPM	JENJANG	PROGRAM STUDI	PERGURUAN TINGGI	JUMLAH SEMESTER YANG DIBERIKAN BANTUAN UKT
1	2	3	4	5	6	7
42	Siti Nurohmatiljanah Setiawan	2006564464	S2	Kajian Timur Tengah Islam Konsentrasi Politik dan Hubungan Internasional Timur Tengah	Universitas Indonesia	2
43	Fia Lutfiatul Hamidatul Irsyad	20217270036	S2	Pendidikan MIPA	Universitas Indraprasta PGRI	2
44	Ajie Kurniawan Azhari	20080021202	S2	Ilmu Komunikasi	Universitas Islam Bandung	2
45	Ruhyatul Aliyah	10020219029	S1	Komunikasi dan Penyiaran Islam	Universitas Islam Bandung	2
46	Iwa Budiana	4103810419091	S3	Ilmu Pendidikan	Universitas Islam Nusantara Bandung	2
47	Victor Deak	4103810419096	S3	Ilmu Pendidikan	Universitas Islam Nusantara Bandung	2
48	Nuril Ihsani	41032124191011	S1	Pendidikan Bahasa Arab	Universitas Islam Nusantara Bandung	2
49	Widiawati	41032121191006	S1	Pendidikan Bahasa dan Sastra Indonesia	Universitas Islam Nusantara Bandung	2
50	Mutia Nur Hanisa Dini Mahadi	3311191031	S1	Farmasi	Universitas Jendral Achmad Yani	2
51	Jeffry Vanderio Butar Butar	20191310011	S1	Teknik Informatika	Universitas Kebangsaan Republik Indonesia	2
52	M Ridwan Firdaus	20191310006	S1	Teknik Informatika	Universitas Kebangsaan Republik Indonesia	2
53	Muhamad Ihsan Bahrum	20191310009	S1	Teknik Informatika	Universitas Kebangsaan Republik Indonesia	2
54	Thoriqul Hafidz Prahanto	19255047	S1	Sistem Informasi	Universitas Ma'soem	2
55	Ginan Nafsi	190105005	S1	Bioteknologi	Universitas Muhammadiyah Bandung	2
56	Yusf Tri Herlambang	19703261003	S3	Ilmu Pendidikan Murni	Universitas Negeri Yogyakarta	2

NO	NAMA	NPM	JENJANG	PROGRAM STUDI	PERGURUAN TINGGI	JUMLAH SEMESTER YANG DIBERIKAN BANTUAN UKT
1	2	3	4	5	6	7
57	Saleha Rodiah	210130190021	S3	Ilmu Komunikasi	Universitas Padjadjaran	2
58	Alamsyah	150130210507	S3	Ilmu Pertanian	Universitas Padjadjaran	2
59	Predi Nanda Kurnia	150130210013	S3	Ilmu Pertanian	Universitas Padjadjaran	2
60	Arifa Syahanna Mahdya	150320210007	S2	Agronomi - Ekofisiologi Tanaman	Universitas Padjadjaran	2
61	Djaka Abdurrachman	150120210012	S2	Ekonomi Pertanian	Universitas Padjadjaran	2
62	Mochammad Taufiq	150120210013	S2	Ekonomi Pertanian	Universitas Padjadjaran	2
63	Perdi Setiawan	150120210006	S2	Ekonomi Pertanian	Universitas Padjadjaran	2
64	U Fawwidh Amry Ilallah	270120200006	S2	Teknik Geologi	Universitas Padjadjaran	2
65	Muhammad Aditya Sholeh Sobandi	180310190046	S1	Sejarah	Universitas Padjadjaran	2
66	Hasna Nur Afifah	240310190038	S1	Teknologi Industri Pertanian	Universitas Padjadjaran	2
67	Elshafira Alharitsza	150104190011	D4	Agroteknopreneur	Universitas Padjadjaran	2
68	Atep Suhendar	199020002	S3	Ilmu Administrasi Publik	Universitas Pasundan	2
69	M Dana Prihadi	2108924	S3	Ilmu Manajemen	Universitas Pendidikan Indonesia	2
70	Ria Saputri	1907280	S3	Pendidikan Bahasa dan Sastra Indonesia	Universitas Pendidikan Indonesia	2
71	Rohayati	1906653	S3	Pendidikan Bahasa Indonesia	Universitas Pendidikan Indonesia	2
72	Wati Sukmawati	1906887	S3	Pendidikan IPA	Universitas Pendidikan Indonesia	2

NO	NAMA	NPM	JENJANG	PROGRAM STUDI	PERGURUAN TINGGI	JUMLAH SEMESTER YANG DIBERIKAN BANTUAN UKT
1	2	3	4	5	6	7
73	Rani Rasyida	2105325	S2	Pendidikan Ilmu Komputer	Universitas Pendidikan Indonesia	2
74	Dea Amanda	2002258	S2	Pengembangan Kurikulum	Universitas Pendidikan Indonesia	2
75	Aghnat Siti Merjania	1901384	S1	Pendidikan Khusus	Universitas Pendidikan Indonesia	2
76	Mirwan Malik Kustoni	21111710007	S1	Teknik Industri	Universitas Sangga Buana Bandung	2
77	Neneng Yanti Andriani	221022008013	S3	Ilmu Ekonomi	Universitas Trisakti	2
78	Sindrawati	221022018004	S3	Ilmu Ekonomi	Universitas Trisakti	2
79	Zachra Athira Khoerunnisa	119101146	S1	Akuntansi	Universitas Widyatama	2
80	Intan Savira	132010119039	S1	Kesehatan Masyarakat	Universitas Wiralodra	2

PELAKSANA TUGAS
DEPUTI BIDANG SUMBER DAYA MANUSIA
ILMU PENGETAHUAN DAN TEKNOLOGI
BADAN RISET DAN INOVASI NASIONAL,

Ttd.

EDY GIRI RACHMAN PUTRA

Salinan sesuai dengan aslinya,
Sekretaris Deputi
Bidang Sumber Daya Manusia
Ilmu Pengetahuan dan Teknologi



Nining Setyowati Dwi Andayani

ITEM RESPONSE ANALYSIS OF UNDERSTANDING CONCEPTS OF MATERIAL CHEMISTRY WITH RADEC MODELS IN PHARMACEUTICAL STUDENTS

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Abstract

This study uses the RADEC model - Read, Answer, Discuss, Explain, and Create—to examine students' conceptual comprehension and identify misconceptions they have about the learning resources they are using. The research methodology makes use of descriptive quantitative data that is processed through analysis of the Rasch model's response pattern. Data was collected using multiple-choice test instruments, with 10 questions with concept material on classification, structure, and material properties, as well as the basic laws of chemistry. Respondents were taken randomly from as many as 20 people. Based on the data obtained, the questions were categorized into 10% (very difficult), 40% (difficult), 30% (easy), and 20% (very easy). In addition, based on their level of understanding, students were grouped into groups of 20% (high), 35% (moderate), and 45% (low). Almost all high-ability students have difficulties understanding the basic law concepts of matter at level 2. The same students find it relatively easy to understand the structure and properties of matter at level 1 and relate material concepts macroscopically and sub-microscopically at level 3. This discovery is anticipated to serve as a guideline for other studies to specify processes in integrating diagnostic and summative measurement findings with the Rasch model in order to evaluate conceptual comprehension and diagnose more chemical misunderstandings.

Keywords: Concept understanding, Item response, Material, Radec, Rasch

1. Introduction

Response item analysis of understanding the chemical concepts of materials using the RADEC models in pharmaceutical students is very important to do because so far there are still many students who have difficulty learning chemical concepts. The material concept is the primary material studied by first-semester pharmacy students in introductory chemistry lectures. The concept of matter has the same abstract character as other chemical concepts [1]. In this study, students learn material concepts from understanding, classification, properties, and colloids to the fundamental laws of matter and their implementation without paying attention to multiple aspects of chemical representation [2]. Because the concept of the material presented is incomplete, students have difficulty understanding the concept of the material. Thus, students understand the concept of material that differs from one student to another [3]. This is because students have different ways of understanding a concept [4] that are even different from the concept issued by experts. Understanding concepts that are different from concepts issued by experts can be said to be in terms of misconceptions [5, 6], bias [7], alternative frameworks [8], and student conceptions [9]. In this study, the term that is consistently used is a misconception. When students have a different understanding of concepts from experts and create misconceptions, it is essential to identify and improve concepts in learning. To overcome this misconception, the learning process is carried out by applying the RADEC model (Read, Answer, Discuss, Explain, and Create). This learning model directs students to study independently by reading and working on pre-learning questions, discussing with small groups to minimize misconceptions that may occur, presenting the results of discussions in large groups to ensure the concepts obtained are correct, and ends by making creations from understanding concepts what students understand [10].

The treatment that will be carried out is to analyze the misconceptions experienced by students. Many instruments have been developed, including concept maps, essay tests, interviews, essays with interviews, and multiple-choice questions. In addition, some use multiple-choice instruments to perform analysis of misconceptions [11, 12]. The use of multiple-choice instruments aims to diagnose misconceptions experienced by students. This misconception diagnosis tool is effectively used to determine the level of understanding of students' concepts. However, this type of instrument does not provide feedback (summative) and is not specific (unidimensional) [13], in addition to concluding the results of the analysis using a multilevel multiple-choice instrument. It is also considered weak because it is taken from the results of the raw score analysis and only provides limited feedback [14, 15]. This analysis is due to the instrument's limitations in measuring student understanding. In addition, the reasons expressed by students in answering multiple-choice questions will also make it difficult for lecturers to make appropriate instructional decisions [16]. Over time, many researchers are currently focusing on cases of misconception, and new instruments have been developed that do not only diagnose students' conceptual understanding. It has been developed by integrating diagnostic assessment with a summative assessment with the Rasch model. This instrument was first developed [17-19].

A good understanding of matter at the macroscopic, microscopic, and symbolic levels will affect the knowledge of subsequent concepts such as macroscopic, microscopic, and symbolic atomic structures [20]. This fact demonstrates the value of logic in understanding chemistry and its complexity. Both teachers and students

find this to be challenging [21]. Students must have a solid understanding of material principles to understand chemical concepts properly. The ability of students to interpret the state of particles when a material changes shape must also be measured to evaluate students' conceptual grasp of topics on material concepts [22-26]. Diagnostic techniques are frequently used in essay examinations, essays, and interviews to research the subject. Based on the initial findings, the equipment is further examined. This method is considered ineffective and significantly less accurate in identifying student misunderstandings and idea understanding patterns. Although impractical, the majority of researchers in Indonesia measure student learning progress using traditional methodologies. According to lecturers, evaluating students' raw scores is an efficient way to gauge their learning of new material. Many people consider a student's raw score to be an early signal of the variable being assessed, and because of its transient character, it is unsuitable as a conclusive metric. Additionally, raw scores' information regarding the decision-making process is restricted [27, 28].

The originality of this research lies in creating a diagnostic tool that combines students' conceptual comprehension with diagnostic measurement of misconceptions about ideas from learning materials using the analytical approach to the level of difficulty of the items seen from the response pattern of the Rasch model items. The study uses several test kits to measure student learning using the Radec model progress on numerous topics and to give practitioners and researchers information on science education. This study aimed to evaluate the instrument's efficiency in identifying misunderstandings regarding conceptual content and conceptual knowledge in students, as well as the instrument's gender-related effects and student patterns of conceptual understanding and misconceptions. Thus, the following research query is presented: How well does the measurement tool capture students' conceptual understanding?

2.Methods

Students' comprehension of various chemical representations in the ideas of classification, structure, and qualities of matter, colloids, and fundamental laws of matter is addressed as a measurable variable in the descriptive-quantitative research method employed in this study. The researcher kept the learning process and the instructional materials. In other words, no assistance is provided to pupils in order for them to complete all of the measurement instrument's questions.

The data collection stage is carried out for two months in the semester between the 2020-2021 school year; The process is carried out after obtaining approval from the university through the dean of the faculty, head of the study program, supporting lecturers, and to balance the code of ethics for research students who take part in the research have also given a letter stating their willingness to participate in the research until it is completed and without coercion. The university will facilitate the data collection process according to a predetermined schedule.

The respondents were 20 students from basic chemistry classes in the intermediate semester in one of the pharmaceutical study programs in Indonesia. Learning is carried out using the Radec model, and students learn independently, in groups (4 people per group), and in large groups in one class. Table 1 displays the distribution of respondents.

Table 1. Demographic profile of respondents (N=20).

Respondents	Sum	Respondent Code
Man	4	P7, P8,P9,P10
Woman	16	P1,P2,P3,P4,P5,P6,P11,P12,P13,P14,P15, P16,P17,P18,P19,P20
Total	20	

The study's participants were chosen randomly from the respondents who willingly volunteered. Additionally, they do not receive learning assistance or any other care that would enable them to finish the measuring instrument. Because offline learning is still not an option in the Covid-19 pandemic scenario, students are expected to complete the instruments online under the supervision of a lecturer. Each student was given 30 minutes to complete all the test questions. After the session, everyone submits their answers, and the number of submissions is assumed to correspond to the number of participants. All participants in this activity are advised that the privacy of their identities is wholly protected and research.

2.1. Development of Instruments and Procedures

As described in the recommendations, the construct map definition, item design, result form, and measurement model are the four basic steps that make up the design process [29].

Define the build map in Stage 1. Scalable constructions are defined in-depth by the map; if more constructs are assessed, the degree of the constructs will change qualitatively [30]. In order to gauge student development, it seeks to create a map of student knowledge [31, 32]. The instrument used under the Semester Learning Plan (also known as RPS), as shown in Tables 2, 3, and 4, incorporates factors, including students' conceptual comprehension and assumptions in elaborating material concepts [33].

Table 2. Conceptual understanding level 3.

Level 3 Students can relate material concepts at the macroscopic and submicroscopic levels	
Rusting Phenomenon: Question 2. If the iron pipe is left in the air, over time it will form iron rust (Fe ₂ O ₃). Iron rust is a...	Q2
The phenomenon of coagulation events: Question : 5. Preconception of coagulation events in colloidal particles	Q5
Brownian motion phenomenon: 6. Brown motion preconception	Q6
Adsorption Phenomenon on Colloid: 7. Preconception of colloidal properties	Q7

Table 3. Conceptual understanding level 2.

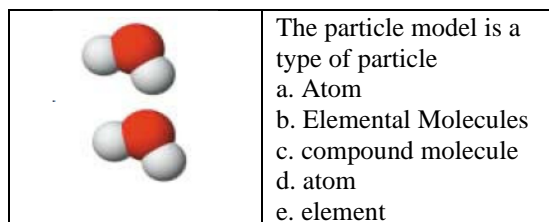
Level 2 Students can explain the classification of matter and the basic laws of matter	
8. Students' preconceptions of colloids	Q8
9. Preconception of chemical equations	Q9
10. Preconceptions of the basic law of matter	Q10

Table 4. Conceptual understanding level 1.

Level 1 Students can explain the structure and properties of the constituent materials	
1. Preconceptions about the nature of the components that make up matter.	Q1
3. Preconception of particle model structure	Q3
4. Preconception of the structure of the particle model	Q4

Variations in the idea knowledge level characterize pupils' conceptual development process. Students must identify the structure and characteristics of the parts that make up the substance in the first level. Students must identify the second level's classification and fundamental rules of matter. Students are also challenged to draw links between material concepts at the macroscopic and submicroscopic levels at the third level. The construct map also reveals the students' preconception tendencies for each stage.

Item Design and Evaluation at Stage 2 Choosing the things to be used as proof that pupils have a conceptual comprehension of the construct map is what this phase entails. Different items may be more or less valuable in gauging pupils' conceptual knowledge. Multiple-choice questions were selected since they are seen to be more valuable and efficient. Validation, reliability, and small-scale trials constructed the conceptual framework for comprehending test equipment. Each question has one correct answer and four distracting answer options. The distractor answer options were created, considering the students' general preconceptions as a sensible choice to divert students from the correct answer (see Table 2). The distractor assists in highlighting the item's capacity for diagnosis [34] - a Q4 in Fig. 1.

**Fig. 1. an example of the Q4 item design.**

The ability to identify the structure and characteristics of the material is tested in question Q4 of the exam. The correct answer is option c, whereas options a, b, d, and e are distractions. A wrong response receives a value of 0, whereas a correct response receives a value of 1. There is a 0.20 percent probability that any student will select the correct response. Based on their comprehension, students will select the response they believe is right. Students cannot guess the correct answer if the distractor item choice is successful.

Stage 3: Design the blank results, including the construct map and item correlation. In other words, it seeks to define the fit between the contents of the measured variable and the responses that students select. This phase strives to determine the correlation between the answers that students select and their

conceptual comprehension. To be evaluated by pupils during testing. The technique obtained ten test question items. The instrument's student responses were manually entered using a written answer sheet. The lecturer supervises this test according to the predetermined timetable. Each student must finish all exam items within the given 30 minutes. Because the activities are conducted online, instrument sheets are collected by submitting, and a checking mechanism is used to ensure that the number of instrument sheets obtained and the number of students taking the test match.

Stage 4: Rasch model analysis approach at stage four. As a result of the probabilistic expectations of item "i" and student "n," the analysis incorporates the method. The statement is the likelihood that student n will choose the correct response to item I ($x = 1$) and that students will have misconceptions, given student ability, n, and item difficulty level [35]. Adding the abovementioned logarithm equation is made more straightforward so that the likelihood of receiving the correct response is equal to the student's aptitude minus the difficulty of the question. Items and student units (persons) are treated independently and on the same interval scale. Students' questions are graded on their degree of aptitude and complexity using odds or logs ranging from -00 to +00. When the items on the item difficulty level are compared to the distribution of student ability levels, the instrument's effectiveness may be judged on how well it captures students' conceptual understanding and misconceptions. Additionally, based on the dimensions of the objects, the degree of student comprehension is identified. The previous procedures show the critical distinctions between the Rasch model analysis and the more common raw score-based analysis; the latter is less reliable in assessing student abilities, as evidenced by the difficulty level of various items [36, 37].

2.2. Data Analysis

For this investigation, raw data were transformed into interval data using WINSTEPS software version 3.75 [38]. The conversion outcome calibrates the data for the items' ability and difficulty levels for the same measurement interval. Additionally, the diagnostic test item response pattern analysis was completed in three stages: 1) the transformation of the raw scores into homogeneous unit intervals and the effectiveness of the analysis of the measuring instrument; 2) the Differential Item Functioning (DIF) test for assessing the disparity in students' conceptual understanding; and 3) the item response patterns for diagnosing student preconceptions.

3. Result and Discussion

3.1. Reliability test

This study's person and item reliability test results show that for the person reliability findings. This reliability test's objective is to evaluate the consistency of the collected data. Table 5 displays the reliability test's outcomes.

Table 5. Summary of fit. statistics.

Parameter (N)	Measure	INFIT		OUTFIT		Separation	Reliability	SD	KR-20
		MNSQ	ZSTD	MNSQ	ZSTD				
Student (20)	-0.08	1.00	-0.15	1.10	-0.09	0.75	0.36	0.66	0.82
Item (10)	0.00	0.94	-0.18	1.10	0.21	2.01	0.80	1.70	

According to Table 5, a person's reliability score of 0.36 equals a person's separation score of 0.75. In other words, the consistency of students' test-taking replies is less critical. The Cronbach Alpha Coefficient (KR-20) score of 0.82, which denotes a positive interaction generated between students and the test instrument, reveals that despite lacking, students answer item questions well. This data progressively demonstrates a high association between student reactions to these questions and student knowledge, typically more cohesive in a way that makes it measurable [39]. This information is crucial for researchers and educators because it helps them build follow-up strategies, enhance student abilities, and identify common misconceptions [40]. These outcomes also yield an item separation index value of 2.01, comparable to an item reliability value of 0.80, and are relatively high. This data demonstrates the goods' excellent uniformity. The outcomes of the infit and outfit scores, where most items are in the acceptable range for multiple-choice assessments, prove this.

To demonstrate the accuracy of the measurement, Fig. 2 shows a graph of the measurement data. The measurement reliability value tends to rise the higher the end of the information function graph. Measurement data is placed very highly at the intermediate level of student ability (-3.0 logit to +3.0 logit). This data demonstrates that students with moderate skill levels can obtain the best results with the TPKP instrument. These findings indicate that the equipment has a high degree of measurement accuracy.

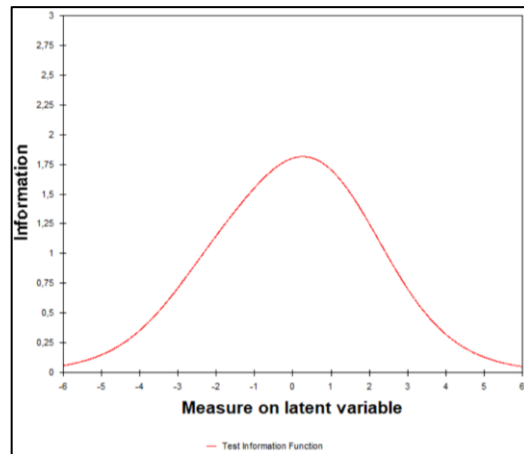


Fig. 2. The function of measurement information.

3.2. Validity

The established criteria ensure that all items fit the Rasch model. The item fit test is used to measure the validity of the items. The technique establishes the test items' validity or assesses whether they can accurately measure the desired characteristics. The criteria include point size correlation (PTMEA Corr), outfit mean square (MNSQ): 0.5 y 1.5, and z-standard clothing: -2.0 Z + 2.0. The association between item scores and body size that makes up the PTMEA correction must be positive and not too close to zero [33]. PTMEA Corr requirements: 0.4 x 0.8. If any of the three requirements is not satisfied, the item is insufficient and requires more explanation. Outfit and Infit MNSQ are sensitive to

chi-squares in identifying anomalous response patterns. There are two types of outlier responses: correct answers that low-ability students correctly guessed on questions with a high level of difficulty, or incorrect answers that high-ability students carelessly provided on questions with a low level of complexity. The ideal MNSQ value is anticipated to be 1.0. Table 6 displays the findings of the item appropriateness study.

Table 6. Item statistics: misfit order.

Item	Measure	Infit		Outfit		PTMEA Corr
		MNSQ	ZSTD	MNSQ	ZSTD	
Q3	0.67	1.45	2.00	2.77	1.53	0.28
Q10	1.26	1.19	0.68	1.92	1.61	0.18
Q9	1.26	0.90	-0.25	1.56	1.12	0.42
Q5	-0.10	1.00	0.08	1.04	0.23	0.44
Q2	-0.06	0.89	-0.54	0.79	-0.58	0.54
Q6	-2.17	0.84	-0.28	0.73	-0.09	0.43
Q8	-0.60	0.84	-0.82	0.72	-0.87	0.58
Q4	2.03	0.83	-0.32	0.62	-0.30	0.60
Q7	0.14	0.64	-1.87	0.55	-1.65	0.74
Q1	-2.17	0.56	-1.17	0.31	-0.92	0.67

According to the item misfit data, all items satisfied the Outfit MNSA criteria, and there was no negative PTMEA Corr. This item implies that all items are standard, suitable, and legitimate. Even though certain goods do not fit any of the requirements, this does not degrade the items' quality. For instance, item (Q3) does not satisfy the Outfit MNSQ and PTMEA Corr requirements, and item (Q10) does not satisfy the PTMEA Corr requirements; this is assumed to be due to the small sample size, or $N > 500$.

Map of Wright: Person-Map-Item. The third step is to evaluate the consistency of the items' and students' ability tests' difficulty levels, listed in Table 2. The degree of student skill will likewise increase as the item difficulty level does. Wright Data about the map: Fig. 3 depicts Person-Map-Items. Wright's earlier maps had the effect of covering nearly all student skills with every instrument component. The map shows a range of pupils' talents, from those with very high abilities (logit > 3.0) to those with inferior abilities (logit -2.0). No items matched the student's ability at the intervals of -3.0 logit to -0.5 logit and $+1.0$ logit to $+3.7$ logit, respectively, which also showed a discrepancy. This item indicates that the information generated in relatively rare intervals should be studied. On the other hand, the difficulty level of the things is often between -1.0 and $+1.0$ logit, and these items frequently appear at the same level of difficulty. With a logit of $+2.03$, item Q4 is the most challenging, while items Q1 and Q6 are the simplest with a logit of -2.17 .

Based on the data in Fig. 3, some interesting data were found, including Q4 questions being the most difficult questions when viewed from the measured value ($X > 1.34$), but they are at level 1. Q3 questions are at level 1, Q9 and Q10 questions are at level 1. 2, and Q7 questions are classified as level 7 questions even though they come from different levels and have the same level of difficulty in the eyes of students, and the four questions, when viewed from the measured value ($X = +1.34$), are classified as complex questions. For questions Q5 and Q2, Q8 came from different levels (Q5 and Q2 level 3, Q8 level 2) but received the same assessment by students, which was considered an easy question because of the

measured value ($X = -1.34$). Questions Q1 from level 1 and Q6 from level 3 are considered the most straightforward questions for students because of the measured value ($X < -1.34$). Based on these data, the classification of questions was obtained, namely 10% tough questions, 40% challenging, 30% easy, and 20% straightforward. Based on the data in Fig. 3, students are also grouped based on their level of ability into three groups, namely the high group (P4, P16, P18, P2), the medium group (P6, P3, P9, P12, P15, P17, P19), and the low group (P1, P7, P10, P13, P14, P8, P5, P11, P20). If group 20% of students understand the concept of material in the high category, 35% are in the medium category, and 45% are in the low category. Other researchers can use the data to develop the learning process to improve student understanding because many students are still classified as low-group students. The prior cases revealed differences in the conceptual knowledge of the pupils, suggesting a comparatively low level of conceptual knowledge of the subject matter. Overall, the items' degree of difficulty is similar to the measured construct. As a result, the test's construct validity is substantial [39-41].

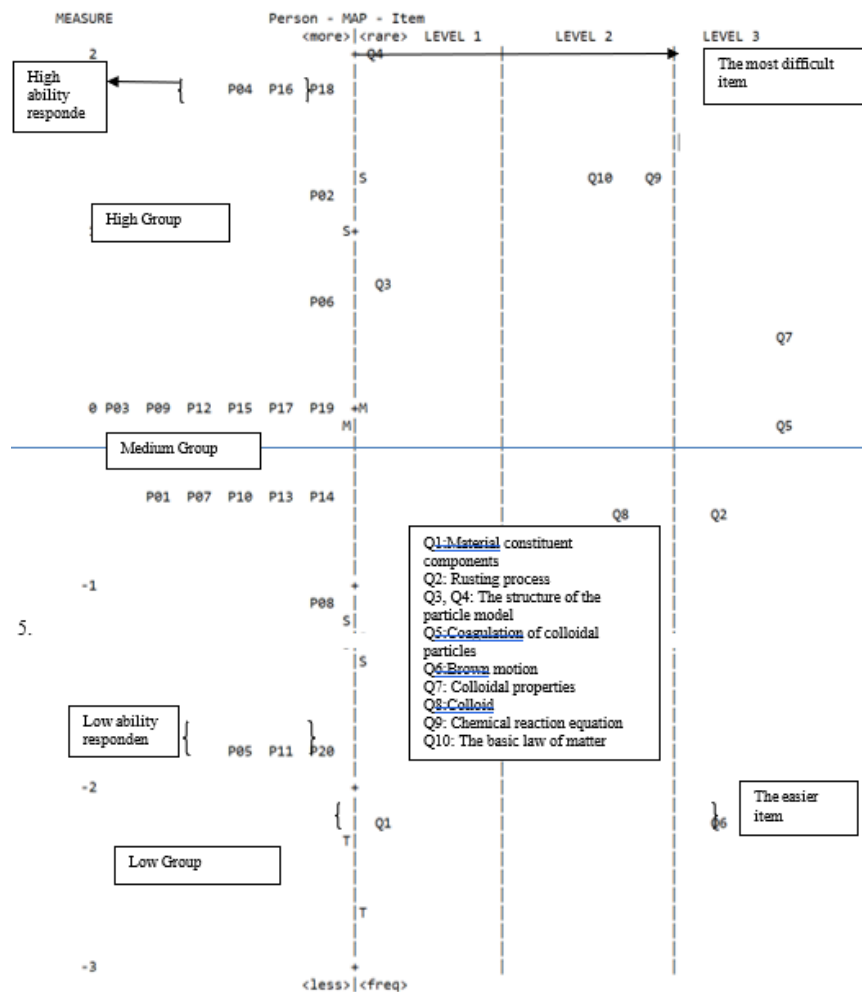


Fig. 3. Wright map: Person-Map-Item.

3.3. The disparity in level of conceptual understanding

The next step is to measure the disparity in students' conceptual understanding of the material concept using differential item functioning (DIF). From these data, we can also analyze the misconceptions experienced by students based on their tendency to answer questions, as shown in Fig. 4.

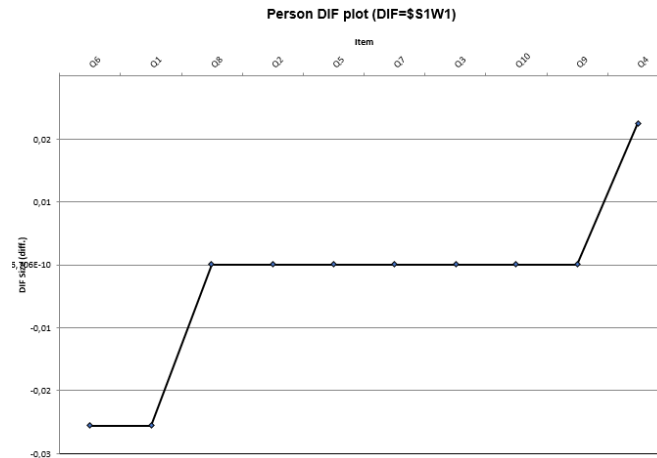


Fig. 4. Person DIF plot.

Based on Fig. 4, the DIF plot shows the level of difficulty experienced by students. Question Q4 is a question that is considered the most difficult by students, as seen from the curve close to the upper limit. As for Q1 and Q6, the questions considered the easiest by students can be seen from the curve close to the lower limit. Based on the picture, the questions are arranged from easiest to hardest Q6, Q1, Q8, Q2, Q5, Q7, Q3, Q10, Q9, and Q4.

3.4. Patterns of conceptual understanding and preconception

The option probability curve test analyzes conceptual and preconception understanding patterns [41, 42]. The option probability curve seeks to illustrate the likelihood of selecting each response option to clarify the level of performance of all students in the assessed item [43]. The test is predicated on the idea that when the distractor's choice curve declines, the correct response curve will rise [44]. The resulting curve for items affected by distractor choices typically does not follow the monotonous behavior of conventional items, for which each answer choice is considered separately.

Five possible answers are given on the test, producing five curves. Each curve shows how well students grasp a concept. Low-ability students frequently select items that will divert them [45]. Based on the five-choice probability curves in Fig. 5, the students' conceptual comprehension and preconception pattern is described below.

Based on Fig. 5 for Q1 questions, 17 students answered correctly, so Q1 questions became the questions that were considered the easiest by students; Q1 questions about the components that make up the material, and it was found that three students were fooled and had misconceptions. Students who experience

misconceptions and are deceived think that the materials that still have their constituent properties when combined are elements and mixtures. Question Q2 is about the phenomenon of rust. Most students answered correctly if rust is a compound, but confused students think that rust is an element, mixture, substance, and compound molecule. In the Q3 question regarding the particle model, a submicroscopic image of an elemental molecule was presented, but most students answered that the image was an element. Other misconceptions were seen in the student's answer choices by answering atoms, molecules, compounds, and ions. In question Q4 about the particle model, a submicroscopic image of a compound molecule is presented, but most of the students answered that the image was an atom; another misconception was also seen from the student's answer choices by answering elements, molecules of elements, and ions.

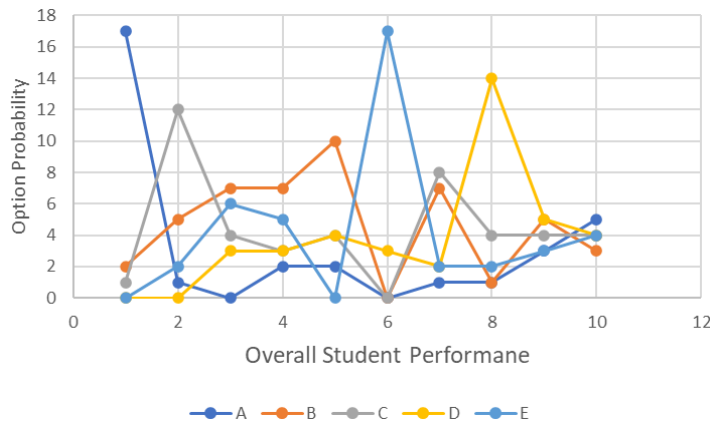


Fig. 5. Option probability curve.

Question Q5 presented questions about events, including coagulation, and the correct answer was the process of treating stomach pain. Most of the students answered correctly, but there were still students who needed to be more deceived and had misconceptions by answering with clumping of latex and clearing mud from river water. In question Q6, the question contains Brownian motion, and most of the students answered correctly by answering that Brown's motion is a collision of medium molecules with colloidal particles. However, students are still misled and have misconceptions by assuming that Brown's motion is a collision between colloidal particles. Most of the students answered correctly in question Q7 about colloidal properties regarding adsorption, which was presented submicroscopically with pictures. However, some students still needed clarification and had misconceptions by answering that colloid properties that can absorb ions on the surface are absorption, electrophoresis, and some consider electrophoresis. In the Q8 questions about hydrophobic colloids, most students answered correctly: fat in water. However, students who had misconceptions and were deceived chose the answers of egg white in water, gelatin in water, and protein in water. In the Q9 question, students are asked to calculate the quantity of residue that will remain after the reaction; most students had wrong answers and misconceptions. Students are asked to calculate the mass ratio of hydrogen in question Q10; most of the correct responses came from 5 students, while the remaining students got it wrong by selecting the erroneous answer options and needing clarification.

3.5. Discussion

The outcomes demonstrated that the tool had good efficacy, satisfied the criteria for person and item dependability, and had good construct validity. When used to assess conceptual comprehension and common misunderstandings among students, it was discovered that all high-ability students needed help comprehending material concepts at level 2 of the fundamental laws of matter. The same student found it reasonably simple to comprehend the level 1 questions' structure and nature and the level 3 questions' linked macro- and micro-material ideas. Second, data on the responses of high-ability kids to particular items is highly systematic, repetitive, and consistent. This data points to both a latent and permanent preconception. The item response pattern approach can investigate in-depth and, ultimately, students' knowledge of concepts and preconceptions, according to the probability curve analysis for Q9 and Q10.

The Rasch model technique, which incorporates diagnostic and summative development procedures in the instrument, produces detailed, accurate, and measurable results in the order of verification. Preconception samples like Q4 and Q7 revealed that distractors were frequently picked over the correct responses. Additionally, it reveals the key concepts that pupils need more familiarity with and the degree to which they hold misconceptions.

The strategy utilized in this study is a useful example for lecturers to use when assessing the learning process with Radee models, debunking common misconceptions, and tracking student learning progress. The combination of qualitative item production techniques and quantitative data analysis has made it possible for lecturers to examine in-depth student understanding, concepts that students grasp and do not understand, and misconceptions [46]. This finding is consistent with previous research showing that probability curves and Rasch model analysis can be used together to diagnose how students' misunderstandings affect their overall conceptual comprehension. Due to the interconnection of people and things, completing this project using a standard methodology would take much work. The item and test difficulty stay constant and independent of the sample used in the original validation, whereas the Rasch model, on the other hand, can overcome such dependencies. This item suggests that the instrument items have complied with the demands of local independence and unidimensionality [47].

Overall, the study provides factual support for the claim that pupils have unique preconceptions due to their learning process. This preconception is viewed as a barrier to pupils' conceptual understanding development. In this study, it was discovered that students' preconceptions were repetitive and organized. As a result, using traditional teaching techniques to intervene and alter pupils' beliefs is challenging [48]. Therefore, it is critical to use purposeful and strategic teaching strategies to eliminate students' misconceptions and foster the development of conceptual knowledge that is in line with science. As a result, lecturers must gather comprehensive data regarding the nature and traits of students' preconceptions [49, 50]. Item response pattern analysis is, thus, an efficient and effective way to get this data. In order to create effective and measurable learning designs to address student misconceptions, knowledge of students' preconceptions is crucial. This item is consistent with earlier research, which contends that the learning process and student learning environment significantly impact the quality of learning progress.

4. Conclusion

Concerning testing students' conceptual comprehension and preconceptions when elaborating the properties of the material notion with Rader models, the measuring tool created has good validity and reliability. Following the instrument's implementation, the study discovered that:

- Nearly all high-ability students need help comprehending the fundamental laws of matter at level 2. The same students find it relatively easy to understand the structure and nature of matter at level 1 and relate material concepts macroscopically and sub-microscopically at level 3.
- The instruments given to students are categorized into 10% very difficult, 40% difficult, 30% easy, and 20% very easy.
- Also, students are grouped into 20% high, 35% moderate, and 45% low groups based on their level of understanding.

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